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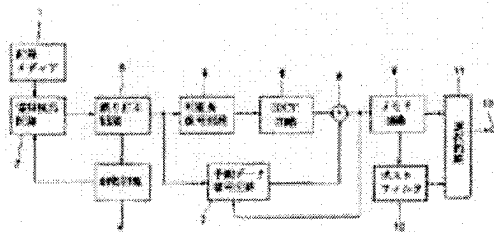
## (54) DIGITAL VIDEO SIGNAL REPRODUCING DEVICE

(57)Abstract:

**PURPOSE:** To make block distortion inconspicuous when a screen is freezed at the time of a special reproduction, in particular, by outputting a reproduced image by performing the post filter by a screen unit after only partial fields or frames are read and decoded at the time of the special reproduction.

**CONSTITUTION:** The image information recorded on a recording media 1 is read by an information detection circuit 2, a digital demodulation, etc., is performed for the information and the information is outputted to an error correction circuit 3. The separated motion vector information is inputted in a predicted data decoding circuit 7, and image information is inputted in a variable length decoding circuit 5 and is outputted to a memory circuit 9 via an IDCT circuit 6 and an adder 8. A selection circuit 11 selects the image information to be outputted by synchronizing with a frame signal from the memory circuit 9 and outputs the information to an output terminal 12 at the time of a normal reproduction.

At the time of a high speed reproduction, the image information that a filter processing is performed for the output of the memory circuit 9 by a post filter circuit 10 is selected and is outputted from an output terminal 12.



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**CLAIMS**

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[Claim(s)]

[Claim 1] Digital video signal playback equipment which reads a digital video signal recorded as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT from on an archive medium, and reproduces an image, comprising:

A decoding means which decodes some the fields or frames of said picture information from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal decoded by said decoding means.

[Claim 2] The digital video signal playback equipment according to claim 1 decoding only a coded image (henceforth I picture) changed from on said archive medium in an image of said picture information in said decoding means.

[Claim 3] A part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT characterized by comprising the following as data for special reproduction, Digital video signal playback equipment which reads a digital video signal recorded on area different from data used only at the time of ordinary reproduction from on an archive medium, and reproduces an image.

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a special reproduction image decoded by said decoding means.

[Claim 4] The digital video signal playback equipment according to claim 3, wherein a part of I picture of said picture information is recorded as data for special reproduction on said archive medium.

[Claim 5] Digital video signal playback equipment which reads a digital video signal recorded as picture information by which high efficiency coding was carried out using orthogonal transformation from on an archive medium, and reproduces an image, comprising:

A decoding means which decodes said a part of digital video signal from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal decoded by said decoding means.

[Claim 6] A part of picture information characterized by comprising the following by which high efficiency coding was carried out using orthogonal transformation as data for special reproduction, Digital video signal playback equipment which reads a digital video signal recorded on area different from data used only at the time of ordinary reproduction from on an archive medium, and reproduces an image.

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a special reproduction image decoded by said decoding means.

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the digital video signal playback equipment which plays the coded digital video signal which is recorded on archive media, such as an optical disc and magnetic tape.

[0002]

[Description of the Prior Art] There is a hybrid coding method which combined prediction coding between pictures using motion compensation prediction as one of the low bit rate coding methods in the case of coding a video signal and the conversion coding within a picture.

Drawing 14 is a block circuit diagram showing an example of the conventional digital video signal playback equipment constituted according to ISO-IEC/JTC1/SC29/WG11 MPEG92/N0245 Test Model 2 of CCITT. In this conventional example, the video signal coded by this hybrid coding method is recorded also on the archive media 1, such as an optical disc and magnetic tape.

[0003] In drawing 14, the video signal currently recorded on the archive medium 1 is read one by one by the information detecting circuit 2, and is inputted into the error correction circuit 3. The output of the error correction circuit 3 is inputted into the control circuit 4, and controls the information detecting circuit 2 by the control circuit 4. On the other hand, the output of the error correction circuit 3 is inputted also into the variable length decoding circuit 5, a reverse discrete cosine transform is given in the IDCT circuit 6, and the output is given as the 1st input to the adding machine 8. The output of the error correction circuit 3 is inputted also into the prediction data decoder circuit 7, and the output of the prediction data decoder circuit 7 is given as the 2nd input to the adding machine 8. The added result in the adding machine 8 is outputted from the output terminal 12 via the memory circuit 9.

[0004] Drawing 15 is a block diagram showing the coding equipment for coding a digital video

signal. The digital video signal reproduced in conventional digital video signal playback equipment is recorded on the archive medium 1 as coding data by the system as shown in drawing 15. In drawing 15, the digital video signal inputted from the input terminal 80 is first inputted into the memory circuit 81. The video signal 92a outputted from the memory circuit 81 is given as the 1st input to the subtractor 82, and the 2nd input to the motion compensation prediction circuit 90. The output of the subtractor 82 is inputted into the quantization circuit 84 via DCT circuit 83. The output of the quantization circuit 84 is inputted into the error correction circuit 86 via the variable-length-coding circuit 85. Digital modulation is given by the modulation circuit 91 and the output of the error correction circuit 86 is recorded on the archive medium 1 as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT (discrete cosine transform).

[0005]On the other hand, the output of the quantization circuit 84 is inputted also into the IDCT circuit 88 via the inverse quantizing circuit 87. The output of the IDCT circuit 88 is given as the 1st input to the adding machine 89. The picture information 93a which is an added result of the adding machine 89 is given as the 1st input to the motion compensation prediction circuit 90. The estimated image information 94a which is an output of the motion compensation prediction circuit 90 is given as the 2nd input to the adding machine 89, and the 2nd input to the subtractor 82.

[0006]Drawing 16 is a block circuit diagram showing an example of the motion compensation prediction circuit 90 in the coding equipment of a digital video signal. In a figure, the video signal 92a of the memory circuit 81 is given to the input terminal 92, and the picture information 93a from the adding machine 89 is given to the input terminal 93, respectively. The picture information 93a inputted from the input terminal 93 is inputted into the frame memory 95a or the frame memory 95b via the change machine 95. The image comparison outputted from the frame memory 95a is given as the 1st input to the motion vector detection circuit 96a. The video signal 92a inputted from the input terminal 92 is given to the 2nd input of the motion vector detection circuit 96a. The output of the motion vector detection circuit 96a is inputted into the prediction mode selector 97.

[0007]On the other hand, the image comparison outputted from the frame memory 95b is given as the 1st input to the motion vector detection circuit 96b. The video signal 92a inputted from the input terminal 92 is given to the 2nd input of the motion vector detection circuit 96b. The output of the motion vector detection circuit 96b is given as the 2nd input to the prediction mode selector 97.

[0008]The video signal 92a inputted from the input terminal 92 is given to the 3rd input of the prediction mode selector 97. The 1st output of the prediction mode selector 97 is given as the 1st input to the change machine 98. Zero signal is given to the 2nd input of the change machine 98. As the 3rd input to the change machine 98, the 2nd output of the prediction mode selector 97 is given. The output of the change machine 98 is outputted from the output terminal 94 as the estimated image information 94a.

[0009]Next, the encoding operation in the coding equipment of the digital video signal of

drawing 15 is explained. First, an outline is explained about the video signal part by which prediction coding between pictures is carried out among the video signals recorded by the hybrid coding method which combined prediction coding between pictures using motion compensation prediction, and the conversion coding within a picture.

[0010]Drawing 17 is a key map showing the motion compensation prediction in a coding video signal method. Drawing 18 is a key map showing operation of the memory circuit 81 in a coding video signal method.

[0011]The coded image from which each of a series of picture information was changed in the picture in drawing 17. (It is hereafter called I picture.) It is divided into the picture information of three types of I, uni-directional prediction-coding picture (henceforth P picture)  $P_1 - P_4$ , and both-directions prediction-coding picture (henceforth B picture)  $B_1 - B_{10}$ . For example, when the picture of one sheet is made into I picture at N sheets and one sheet considers it as P picture or I picture at M sheets, n and m as an integer and  $1 \leq m \leq N/M$ ,  $(N \times n + M)$  As for the picture of eye watch, the picture ( $m \neq 1$ ) of I picture and eye watch ( $N \times n + M \times m$ ) makes B picture the picture of P picture and eye watch ( $N \times n + M \times m + 1$ ) ( $N \times n + M \times m + M - 1$ ) to eye watch. At this time, from the picture ( $N \times n + N$ ) of eye watch ( $N \times n + 1$ ) to the picture of eye watch is collectively called GOP (Group of Pictures).

[0012]Here, GOP in  $N = 15$  and  $M = 3$  is shown in drawing 17. In a figure, I picture does not perform prediction between pictures, but performs only conversion coding within a picture. P picture performs prediction from last I picture or P picture. For example, although the 6th picture is P picture among a figure, this performs prediction from 3rd I picture. 9th P picture is predicted from 6th P picture among a figure. B picture is predicted from I picture or P picture of just before and an immediately after. For example, the 4th and 5th B picture will be predicted from the both sides of 3rd I picture and 6th P picture among a figure. Therefore, the 4th and the 5th picture are coded after coding the 6th picture information.

[0013]Drawing 15 is coding equipment for coding the digital video signal of such a hybrid coding method, and the digital video signal inputted from the input terminal 1 is inputted into the memory circuit 81. In the memory circuit 81, picture information is rearranged into encoding order and outputted. That is, since 1st B picture is coded after 3rd I picture in drawing 17 as stated previously, picture information is rearranged here.

[0014]Operation of rearrangement of the picture information in such a memory circuit 81 is shown in drawing 18. The image sequence inputted like drawing 18 (a) is outputted in order of drawing 18 (b). In order that the video signal 92a outputted from the memory circuit 81 may drop the relative redundancy of a time base direction, after difference is taken between picture information with the estimated image information 94a outputted from the motion compensation prediction circuit 90 with the subtractor 82, DCT is given to space shaft orientations in DCT circuit 83. It is quantized in the quantization circuit 84 and the coefficient (DCT coefficient) of the picture information by which DCT transformation was carried out is further inputted into the variable-length-coding circuit 85. In the variable-length-coding circuit 85, variable length coding of the quantized DCT coefficient and the motion vector information is carried out, header

information, such as address information, is added, and it is inputted into the error correction circuit 86.

[0015]In the error correction circuit 86, error correction processing is performed to the picture information inputted, and it outputs to the modulation circuit 91. In the modulation circuit 91, digital modulation of the picture information is carried out, and it records on the archive media 1, such as an optical disc.

[0016]On the other hand, after inverse quantization of the conversion factor quantized by the quantization circuit 84 is carried out in the inverse quantizing circuit 87 and IDCT is given further in the IDC circuit 88, it is added with the estimated image information 94a with the adding machine 89, and the picture information 93a of a decoded image is called for. This picture information 93a is inputted into the motion compensation prediction circuit 90 for coding of the following picture.

[0017]Next, operation of the motion compensation prediction circuit 90 is explained according to each block of drawing 16. In the motion compensation prediction circuit 90, motion compensation prediction of the video signal 92a outputted from the memory circuit 81 is carried out using the picture information of two image comparisons memorized by the frame memory 95a and the frame memory 95b, and the estimated image information 94a is outputted.

[0018]First, when the picture information 93a which was coded as mentioned above and decoded is I picture or P picture, this picture information 93a is memorized by the frame memory 95a or the frame memory 95b for coding of the following image. The change machine 95 is changed so that the direction previously updated in time among the frame memory 95a and the frame memory 95b may be chosen at this time. When the decoded picture information 93a is B picture, the writing to the frame memory 95a and the frame memory 95b is not performed.

[0019]When the 1st of drawing 17 and 2nd B picture are coded by such change, for example, 0th P picture and 3rd I picture are memorized by the frame memory 95a and the frame memory 95b, respectively.

Then, if 6th P picture is coded and decoded, the frame memory 95a will be rewritten by the decoded image of 6th P picture.

[0020]Therefore, when the following 4th and 5th B picture are coded, 6th P picture and 3rd I picture are memorized by the above-mentioned frame memory 95a, respectively. If 9th P picture is coded and decoded, the frame memory 95b will be rewritten by the decoded image of 9th P picture. Therefore, when the 7th and 8th B picture are coded, 6th P picture and 9th P picture are memorized by the above-mentioned frame memory 95b, respectively.

[0021]If the video signal 92a outputted from the memory circuit 81 is inputted into the motion compensation prediction circuit 90, based on the image comparison memorized by the frame memories 95a and 95b, the two motion vector detection circuits 96a and 96b will detect a motion vector, and will output a motion-compensation-prediction picture, respectively. Namely, divide the video signal 92a into two or more image blocks, and about each image block. While choosing the image block that prediction distortion becomes small most in an image comparison and

outputting the relative location of that image block as a motion vector, it is outputting from the output terminal 94 by making this image block into a motion-compensation-prediction picture.

[0022]On the other hand, among two motion-compensation-prediction pictures outputted from the motion vector detection circuits 96a and 96b, and these average pictures, prediction distortion chooses the smallest thing and outputs the prediction mode selector 97 as an estimated image. If the video signal 92a is not a thing about B picture at this time, the motion-compensation-prediction picture equivalent to the image comparison inputted previously in time will always be chosen, and will be outputted from the output terminal 94.

[0023]In the prediction mode selector 97, picture information with the sufficient encoding efficiency among the formation of a picture inner code which does not predict, and prediction coding between pictures by the selected estimated image is chosen. Picture inner code-ization will be chosen whenever the video signal 92a is I picture at this time. When the signal which shows the picture inner code-ized mode when picture inner code-ization is chosen is outputted as prediction mode and prediction coding between pictures is chosen, the signal which shows the selected estimated image is outputted as prediction mode. The change machine 98 outputs the estimated image which it will output zero signal if the prediction mode outputted from the prediction mode selector 97 is the picture inner code-ized mode, otherwise, is outputted from the prediction mode selector 97.

[0024]From the above thing, since the motion compensation prediction circuit 90 always outputs zero signal as the estimated image information 94a when the video signal 92a outputted from the memory circuit 81 is I picture, conversion coding within a picture is carried out [ not performing prediction between pictures ] about the picture information of I picture. the time of the video signal 92a outputted from the memory circuit 81 being 6th P picture of drawing 17, for example - the motion compensation prediction circuit 90 -- the 3rd of drawing 17 -- I picture lost-motion compensation prediction is carried out, and the estimated image information 94a is outputted. the time of the video signal 92a outputted from the memory circuit 81 being 4th B picture of drawing 17, for example -- the motion compensation prediction circuit 90 -- 3rd I picture of drawing 17, and the 6th -- P picture lost-motion compensation prediction is carried out, and the estimated image information 94a is outputted.

[0025]Next, operation of the digital video signal playback equipment constituted like drawing 14 is explained. It is read to the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 3. In the error correction circuit 3, error correction processing of the digital video signal inputted is carried out, and it separates into picture information and motion vector information, and address information. And address information is outputted to the control circuit 4. In the control circuit 4, according to the inputted address information, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head in the position in which the data read to the next is stored is generated.

[0026]Here, in the case of ordinary reproduction, after making the point which starts playback

jump an optical head, it controls by the control circuit 4 to read continuously the data currently recorded on the optical disc. On the other hand, in the case of fast reproduction, there is the method of reading only for example, I picture and reproducing. In this case, in the control circuit 4, the optical head of the information detecting circuit 2 is controlled, an address jump is carried out at the head of I picture, and if read-out of the picture information of I picture is completed, the operation jumped at the head of the following I picture will be repeated.

[0027]However, in order to search the start address of the case where there is much amount of information of I picture, or I picture, when much time is spent, no I pictures can be read from archive media, such as an optical disc, by within a time [ of one frame ]. In such a case, the screen outputted now is frozen, and a reproducing output is updated when read-out of the picture information of the following I picture is completed.

[0028]On the other hand, the picture information separated by the error correction circuit 3 is changed into fixed length data from variable length data by the variable length decoding circuit 5, inverse quantization is further carried out, IDCT is given by the IDCT circuit 6 and it is supplied as the 1st input to the adding machine 8. On the other hand, in the prediction data decoder circuit 7, an estimated image is decoded according to the motion vector information outputted from the error correction circuit 3, and this is given as the 2nd input to the adding machine 8.

[0029]In this case, the prediction data decoder circuit 7 is provided with the frame memory which memorizes the picture information of I picture decoded by the adding machine 8 like the motion compensation prediction circuit 90, and P picture.

At the time of the input of P picture and B picture, an estimated image is reproduced from I picture which is applicable according to motion vector information, and P picture, and it is outputting to the adding machine 8.

About the updating method of the image comparison information on the time of the input of I picture and P picture, since it is the same as the case of the coding equipment of drawing 15, explanation is omitted.

[0030]In the adding machine 8, the output of the prediction data decoder circuit 7 and the output of the IDCT circuit 6 are added, and this added result is outputted to the memory circuit 9.

According to the order to code as shown in drawing 18 at the time of coding, the video signal inputted continuously in time is rearranged per frame as already explained. For this reason, in the memory circuit 9, the picture information of a frame unit inputted in the order shown in drawing 18 (b) is rearranged in order of drawing 18 (a), and it outputs from the output terminal 12 as picture information which continues in time. However, when reproducing only I picture at the time of fast reproduction, in the memory circuit 9, the data list substitute by a picture unit is not performed.

[0031]

[Problem(s) to be Solved by the Invention]Conventional digital video signal playback equipment is constituted as mentioned above, and when performing fast reproduction using I picture, after it detects the head part of GOP from on the bit stream currently recorded on archive media, such as

an optical disc, it will read the data of I picture. For this reason, when the data volume of I picture became very large, or when much time is required in order to search the head part of GOP, a reproducing output is frozen until it reads all picture information from archive media, such as an optical disc. However, when the reproduced image coded with the low rate was frozen, there was a problem that distortion between two or more image blocks which constitute one screen was conspicuous.

[0032]It aims at obtaining the digital video signal playback equipment with which block distortion is not conspicuous at the time of special reproduction, this invention having been made for the purpose of canceling the above problems, and applying a postfilter to a reproduced image at the time of special reproduction.

[0033]

[Means for Solving the Problem]Digital video signal playback equipment which this invention requires for an invention of Claim 1, A digital video signal recorded as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT is read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes some the fields or frames of said picture information from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal read by said decoding means.

[0034]Digital video signal playback equipment concerning an invention of Claim 2 decodes only a coded image (henceforth I picture) changed from on said archive medium in an image of said picture information in said decoding means.

[0035]Digital video signal playback equipment which this invention requires for an invention of Claim 3, As data for special reproduction, a part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT, A digital video signal recorded on area different from data used only at the time of ordinary reproduction is read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a special reproduction picture read from said decoding means.

[0036]Digital video signal playback equipment concerning an invention of Claim 4 is recorded on said archive medium as data for special reproduction in a part of I picture of said picture information.

[0037]Digital video signal playback equipment which this invention requires for an invention of Claim 5 reads a digital video signal recorded as picture information by which high efficiency

coding was carried out using orthogonal transformation from on an archive medium, and is characterized by that digital video signal playback equipment which reproduces an image comprises the following.

A decoding means which decodes said a part of digital video signal from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal decoded by said decoding means.

[0038]Digital video signal playback equipment which this invention requires for an invention of Claim 6, As data for special reproduction, a part of picture information by which high efficiency coding was carried out using orthogonal transformation, A digital video signal recorded on area different from data used only at the time of ordinary reproduction is read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a special reproduction image decoded by said decoding means.

[0039]

[Function]In the digital video signal playback equipment concerning the invention of Claim 1. After reading and decoding some fields or the picture information of a frame at the time of special reproduction from the archive medium on which the picture information by which high efficiency coding was carried out using motion compensation prediction and DCT was recorded, a postfilter is given per screen, Since it outputs as a reproduced image, block distortion cannot be easily conspicuous when a special reproduction picture is frozen.

[0040]In the digital video signal playback equipment concerning the invention of Claim 2. Since the postfilter was given per screen after reading and decoding only the picture information of I picture at the time of special reproduction from the archive medium on which the picture information by which high efficiency coding was carried out to motion compensation prediction using DCT was recorded, block distortion cannot be easily conspicuous when a special reproduction image is frozen.

[0041]In the digital video signal playback equipment concerning the invention of Claim 3. From the archive medium on which the data for special reproduction by which high efficiency coding was carried out using motion compensation prediction and DCT was recorded, Since a postfilter is given per screen and it outputs as a reproduced image after reading only the data for special reproduction from area different from the data for ordinary reproduction and decoding it at the time of special reproduction, block distortion of a special reproduction image cannot be easily conspicuous.

[0042]In the digital video signal playback equipment concerning the invention of Claim 4. Since

a part of I picture of the picture information is recorded as data for special reproduction on the archive medium, After reading a part of I picture of the picture information from area different from the data for ordinary reproduction as data for special reproduction and decoding it at the time of special reproduction, a postfilter is given per screen and it can output as a reproduced image.

[0043]In the digital video signal playback equipment concerning the invention of Claim 5. Since a postfilter is given per screen and it outputs as a reproduced image, after reading and decoding a part of picture information at the time of special reproduction from the archive medium on which the picture information by which high efficiency coding was carried out using orthogonal transformation was recorded, Block distortion etc. cannot be easily conspicuous when a special reproduction picture is frozen.

[0044]According to the digital video signal playback equipment concerning the invention of Claim 6, from the archive medium on which the data for special reproduction by which high efficiency coding was carried out using orthogonal transformation was recorded, the data for [ time of special reproduction ] special reproduction -- Eliau different from the data for ordinary reproduction -- since a postfilter is given per screen and it outputs as a reproduced image after carrying out reading appearance clitteringly and decoding, block distortion of a special reproduction image cannot be easily conspicuous.

[0045]

[Example]

Below working example 1, describes working example 1 of this invention with reference to the attached Drawings. Drawing 1 is a block diagram showing the composition of the digital video signal playback equipment of working example 1 of this invention. In drawing 1, identical codes are attached about the portion the same as that of the conventional device of drawing 14, or considerable. The picture information currently recorded on the archive medium 1 is read by the information detecting circuit 2, carries out digital demodulation and is outputted to the error correction circuit 3. In the error correction circuit 3, error correction processing is performed per output of the information detecting circuit 2, and address information is outputted to the control circuit 4. According to the address information inputted, the information detecting circuit 2 is controlled by the control circuit 4. On the other hand, the output of the error correction circuit 3 is inputted also into the variable length decoding circuit 5, and is given as the 1st input to the adding machine 8 via the IDCT circuit 6. The motion vector information outputted from the error correction circuit 3 is inputted into the prediction data decoder circuit 7, and the output of the prediction data decoder circuit 7 is given as the 2nd input to the adding machine 8. The output of the adding machine 8 is inputted into the postfilter 10 and the selection circuitry 11 via the memory circuit 9. In the selection circuitry 11, either the output of the memory circuit 9 or output of the postfilter 10 is chosen, and it outputs from the output terminal 12.

[0046]Next, operation of the digital video signal playback equipment of working example 1 is explained. Drawing 2 is a key map for explaining the data array on the archive medium 1 in working example 1. This archive medium 1 is recording media, such as an optical disc. Motion

compensation prediction of the digital video signal is carried out to the archive medium 1 here, DCT performs frequency conversion, the prediction error is quantized, and the video signal to which the address information in an error correcting code and GOP units was added is recorded to the picture information by which high efficiency coding was carried out by performing variable-length-coding processing. However, about a highly efficient encoding method, it is the same as the hybrid coding method (drawing 15) explained by the conventional example. Then, on the archive medium 1, although the detailed explanation is omitted, as shown in drawing 2, picture information is recorded by GOP units. The address information in GOP units, etc. are recorded on the header information in the head part of GOP of drawing 2, and picture information is recorded on it in the picture information of I picture below in the turn rearranged into the head as shown in drawing 18 (b).

[0047]It is read by the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 3. In the error correction circuit 3, error correction processing of the digital data to which it restored is carried out, and it separates into the address information, picture information, and motion vector information in GOP units. In the control circuit 4, according to the address information in the GOP units inputted, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head to the information detecting circuit 2 in the position in which the picture information read to the next is stored is generated.

[0048]In the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by this control circuit 4 to read continuously the picture information currently recorded on the optical disc. On the other hand, it plays by reading only the picture information of I picture currently recorded on the head of GOP as shown in drawing 2 from an optical disc in the case of fast reproduction. Then, in the above-mentioned control circuit 4, the optical head of the information detecting circuit 2 is controlled, first, an address jump is carried out, the picture information about I picture is read to the head of GOP, and if it is completed, operation which is jumped at the head of the next GOP will be repeated.

[0049]Here, if all the picture information about I picture can be read to within a time [ of one frame ] when GOP is constituted considering the picture information of 15 frames as a unit, as shown in drawing 17, 15X fast reproduction is realizable. However, since the code amount of a video signal is controlled by GOP units, the amount of information of I picture is not constant, and it changes for every GOP. When reading the video signal recorded there from an optical disc etc., latency speed for an optical head to move to the point of the purpose on an optical disc arises. In order to search the start address of the case where there is much amount of information of I picture, or I picture, when much time is spent, it becomes impossible therefore, to read the video signal about all the I pictures from an optical disc by within a time [ of one frame ].

[0050]In such a case, the screen outputted now is frozen until read-out of the picture information of I picture from the archive medium 1 under present execution is completed. However, the freeze and updating of a screen are performed synchronizing with a frame signal. That is, the

address jump to the head of the next GOP is performed synchronizing with a frame signal, and an address jump is performed according to the frame pulse after reading all the I pictures from an optical disc.

[0051]The motion vector information separated by the error correction circuit 3 is inputted into the prediction data decoder circuit 7, and is inputted into the variable length decoding circuit 5 about picture information. Here, since it is the same as the digital video signal playback equipment of a conventional example about operation of the variable length decoding circuit 5, the IDCT circuit 6, the prediction data decoder circuit 7, and the adding machine 8, those explanation is omitted.

[0052]In the memory circuit 9, the video signal of a picture inputted by a block unit is outputted per line synchronizing with a frame signal. However, rearrangement in a frame unit is performed according to the order which codes the video signal which continues in time at the time of coding as shown in drawing 18. For this reason, in the memory circuit 9, the picture information inputted in the order shown in drawing 18 (b) as an output of the adding machine 8 is rearranged so that the order of drawing 18 (a), i.e., picture information, may continue in time, and it is outputted from the output terminal 12. However, in order to reproduce only I picture at the time of fast reproduction, picture information in a picture unit is not rearranged by the memory circuit 9.

[0053]Therefore, the picture information of I picture outputted from the adding machine 8 at the time of fast reproduction is recorded on the frame memory in the memory circuit 9 per frame, and it outputs as picture information in sync with a frame signal. That is, the change of the frame memory which records picture information, and the frame memory to read is performed synchronizing with a frame signal. However, when read-out of I picture from an optical disc is not completed to within a time [ of one frame ], the change of the frame memory of memory circuit 9 inside is stopped. In this way, the screen outputted now can be frozen until the picture information of all the I pictures is recorded on the memory circuit 9. The selection circuitry 11 chooses from the memory circuit 9 the picture information outputted synchronizing with a frame signal at the time of ordinary reproduction, and outputs it to the output terminal 12. On the other hand, at the time of fast reproduction, the output of the memory circuit 9 chooses the picture information by which filtering was carried out in the postfilter circuit 10, and it outputs from the output terminal 12.

[0054]Here, when a digital video signal is coded at the rate of 5 or less Mbps, block distortion occurs in the reproduced image. Although it cannot check on vision from the image by which ordinary reproduction was carried out, when a screen is frozen, block distortion can check this block distortion clearly. Therefore, when I picture is frozen at the time of fast reproduction and it reproduces, the block distortion of a reproduced image is known clearly. For this reason, the block distortion of a reproduced image is reduced by giving a low pass filter per 1 screen by the postfilter circuit 10 at the time of fast reproduction. In this case, although the resolution of a reproduced image falls with a low pass filter, it is common for the reproduced image with which unnatural block distortion is conspicuous to be subjectively more unsightly than the picture to

which resolution fell as a reproduced image at the time of fast reproduction. That is, the fast reproduction in which block distortion is not conspicuous is realizable by giving a postfilter per screen to the reproduced image at the time of fast reproduction.

[0055]Drawing 3 is a block diagram showing an example of this postfilter circuit 10. As shown here, the postfilter circuit 10 has given LPF to the perpendicular direction actually by vertical LPF32, after giving horizontal LPF by level LPF31 to the picture information inputted per line. Drawing 4 is a figure showing the frequency characteristic of the postfilter circuit 10 in working example 1. A multiplication coefficient is constituted by the multiplier of  $A0 = 0.603513641$ ,  $A1 = 0.25530132$ ,  $A2 = -0.05175682$ ,  $A3 = -0.00530132$  as this postfilter circuit 10 is shown in drawing 5 and drawing 6. The FIR filter of seven taps with the frequency characteristic shown in drawing 4 is used.

[0056]If level LPF31 is constituted as LPF of seven taps, it comes to be shown in drawing 5. That is, in drawing 5, the picture information inputted by six steps of flip-flop (FF)41-46 by which subordinate connection was carried out is delayed. And the picture information to which a multiplication coefficient becomes the same is added by the adding machines 47-49, respectively, and carries out the multiplication of the output of these adding machines 47-49, and the output of FF43 to a predetermined multiplication coefficient with the multipliers 50-53. The horizontal filter of seven taps is constituted by adding the result with the adding machine 54. Vertical LPF32 can be constituted as shown in drawing 6. That is, picture information is being delayed to the perpendicular direction by the six line memories 61-66. The picture information to which a multiplication coefficient becomes the same is added by the adding machines 67-69, respectively, and carries out the multiplication of the output of these adding machines 67-69, and the output of the line memory 63 to a predetermined multiplication coefficient with the multipliers 70-73. The vertical filter of seven taps is constituted by adding the result with the adding machine 74.

[0057]The address jump was carried out at the picture information of I picture currently recorded on the head of GOP at the time of fast reproduction, in above-mentioned working example, after read-out of I picture is completed, it has jumped to I picture of the next GOP, but the address jump to the next GOP may be performed per fixed time. That is, the picture information of I picture is read from the archive media 1, such as an optical disc, within the fixed time decided beforehand, and even if read-out of I picture is not completed in fixed time, an address jump is performed at the head of the next GOP. For this reason, only the picture information of the area which was able to be read from the archive medium 1 as shown in drawing 7 is updated, and a fast reproduction picture is reproduced. In this case, the boundary of the portion updated by the postfilter circuit 10 in the screen and the area which is not updated can be made not conspicuous.

[0058]Although the archive medium 1 was used as the optical disc in above-mentioned working example, it is not necessary to be necessarily an optical disc. The same effect can be acquired also about archive media, such as magnetic tape. Although LPF of seven taps is used as the postfilter 10 in above-mentioned working example, it is not necessary to be necessarily seven taps, and LPF can consist of arbitrary tap numbers.

[0059]Furthermore, in above-mentioned working example, although the picture information of the postfilter circuit 10 was chosen only at the time of fast reproduction, the postfilter circuit 10 can be used also at the times of other special reproduction, such as the time of slow reproduction and still playback, and block distortion can be reduced. When being outputted without freezing a reproduction screen also in the time of fast reproduction, the block distortion of a reproduced image stops being conspicuous. The selection circuitry 11 may be controlled so that it carries out and backlash does not give a postfilter in such a case.

[0060]moreover -- above-mentioned working example -- special reproduction -- every, although explained as what reads only I picture of GOP from a disk and is played, Even when performing fast reproduction by reproducing arbitrary pictures, such as P picture, block distortion can be similarly reduced using the postfilter circuit 10. It is not necessary to necessarily reproduce all the I pictures from each GOP, and I picture may be reproduced only once per GOP number.

[0061]Working example 2 of this invention is described for working example 2. Ranking next. In the digital video signal playback equipment of working example 2. The data used only at the time of ordinary reproduction reads independently the digital video signal separated as data for special reproduction from on an archive medium, and he is trying for a part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT to reproduce it.

[0062]Drawing 8 is a block diagram showing the composition of the digital video signal playback equipment in working example 2 of this invention. In this figure, identical codes are attached about the portion the same as that of the device of drawing 1, or considerable. 13 is an error correction circuit, it carries out digital demodulation of the output of the information detecting circuit 2 here, performs error correction processing, and outputs it as picture information separated into address information, motion vector information, the data for special reproduction, and the data for ordinary reproduction from the archive media 1, such as an optical disc. 14 is a block data reconstruction circuit, at the time of ordinary reproduction, sets the data for special reproduction, and the data used only at the time of ordinary reproduction, and reconstructs block data here.

[0063]Operation of the digital video signal playback equipment constituted in this way is explained. A key map for drawing 9 to explain the data array on the archive medium 1 in working example 2 and drawing 10 are the key maps for explaining division of a DCT coefficient. The archive media 1 are recording media, such as an optical disc. Motion compensation prediction of the digital video signal is carried out to the archive medium 1 here, DCT performs frequency conversion, the prediction error is quantized, and the video signal to which the address information in an error correcting code and GOP units was added is recorded to the picture information by which high efficiency coding was carried out by performing variable-length-coding processing further. Among picture information, as shown in drawing 10, the low-pass portion and the high region portion of each other are separated, and the DCT coefficient of I picture is recorded on area where the data for ordinary reproduction is another considering the low-pass ingredient as data for special reproduction. In this case, the data for

ordinary reproduction comprises a low-pass ingredient of I picture, and picture information of P picture and B picture. Therefore, in order to reproduce I picture at the time of ordinary reproduction, it is necessary to reconstruct the low-pass ingredient and high-frequency component which have been recorded on area different, respectively, and to decode the picture information of I picture.

[0064]The low-pass ingredient of I picture means here level and a vertical low-pass ingredient as shown as a field which contains for example, surrounds the important ingredient of picture information with the dashed line of drawing 10, when performing DCT by making 8 pixels x eight lines into unit block size. In this case, even if it decodes only using the low-pass ingredient shown in drawing 10, the contents of the image can be grasped enough. For this reason, image restoration can be performed only using six signals of the low-pass ingredient surrounded with the dashed line of drawing 10 at the time of fast reproduction. If it carries out like this, since it is small compared with the amount of information of the picture information of the whole I picture, the amount of information of the low-pass ingredient of I picture can read all the I pictures by within a time [ of one frame ] at the time of fast reproduction.

[0065]It is read by the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 13. In the error correction circuit 13, error correction processing of the digital data to which it restored is carried out, and it separates into the picture information for ordinary reproduction, the picture information for fast reproduction, motion vector information, and the address information in GOP units. In the control circuit 4, according to the address information in the GOP units inputted, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head to the information detecting circuit 2 in the position in which the picture information read to the next is stored is generated.

[0066]In the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by this control circuit 4 to read continuously the picture information currently recorded on the optical disc. On the other hand, in the case of fast reproduction, only the data for fast reproduction (low-pass ingredient of I picture) currently recorded on the head of GOP as shown in drawing 9 is read from an optical disc, and it plays. Then, in the above-mentioned control circuit 4, the optical head of the information detecting circuit 2 is controlled, an address jump is carried out, the data for fast reproduction is read to the head of I picture, and if it is completed, operation which is jumped at the head of the next GOP will be repeated.

[0067]The motion vector information separated by the error correction circuit 13 is inputted into the prediction data decoder circuit 7, and is inputted into the block data reconstruction circuit 14 about the data for ordinary reproduction, and the data for fast reproduction. Since the coefficient of 1 block is divided into the low-pass ingredient and the high-frequency component as shown in drawing 10, it is necessary to compound a low-pass ingredient and a high-frequency component by each block unit at the time of ordinary reproduction, and to reconstruct picture information about each block of I picture, here.

[0068]That is, in the block data reconstruction circuit 14, the data for fast reproduction which is a low-pass ingredient at the time of ordinary reproduction, and the data for ordinary reproduction which is high-frequency components are compounded, and the picture information for 1 block is reconstructed. On the other hand, at the time of fast reproduction, the picture information for 1 block is compounded in the block data reconstruction circuit 14 only using the data for fast reproduction which is a low-pass ingredient. The output of the block data reconstruction circuit 14 is inputted into the variable length decoding circuit 5, and is decoded as picture information one by one. Here, since it is the same as working example 1 about operation of the variable length decoding circuit 5, the IDCT circuit 6, the prediction data decoder circuit 7, the adding machine 8, and the memory circuit 9, those explanation is omitted.

[0069]The selection circuitry 11 chooses from the memory circuit 9 the picture information outputted synchronizing with a frame signal at the time of ordinary reproduction, and outputs it to the output terminal 12. On the other hand, at the time of fast reproduction, the output of the memory circuit 9 chooses the picture information by which filtering was carried out in the postfilter circuit 10, and it outputs from the output terminal 12.

[0070]When the picture information which coded only the low-pass ingredient of each block as data for fast reproduction here lacks the high-frequency component of each block, block distortion may occur in the reproduced image. Therefore, the block distortion of a reproduced image is clearly known at the time of fast reproduction. For this reason, the block distortion of a reproduced image is reduced by giving a low pass filter per 1 screen by the postfilter circuit 10 at the time of fast reproduction.

[0071]In this case, although the resolution of a reproduced image falls with a low pass filter, it is common for the reproduced image with which unnatural block distortion is conspicuous to be subjectively more unsightly than the picture to which resolution fell as a reproduced image at the time of fast reproduction. That is, the fast reproduction in which block distortion is not conspicuous is realizable by giving a postfilter per screen to the reproduced image at the time of fast reproduction. Here, since it is the same as working example 1 about operation of the postfilter circuit 10, explanation is omitted.

[0072]Although the block data of I picture is divided into a low-pass ingredient and a high-frequency component and it was made to record on another area on an optical disc in above-mentioned working example 2, respectively, It may divide into a low-pass ingredient and high-frequency component other than the block data of I picture also about the block data of P picture, and the data for ordinary reproduction may be recorded on another area by using the former as fast reproduction data.

[0073]Although the block data of I picture was divided into the low-pass ingredient and the high-frequency component and each was recorded on another area on a disk in above-mentioned working example 2, As data for ordinary reproduction, it records without dividing into a low-pass ingredient and a high-frequency component, and it may be made to record only the low-pass ingredient of I picture on another area as data for special reproduction. If it carries out like this, it is not necessary to use the data for special reproduction only at the time of fast reproduction, and

it does not need to reconstruct the low-pass ingredient and high-frequency component of I picture at the time of ordinary reproduction.

[0074]It explains referring to [ to working example 3, rank next ] drawing 11 thru/or drawing 13 for working example 3 of this invention. In working example 3, without using motion compensation prediction, the digital video signal recorded as picture information in which high efficiency coding was carried out by only DCT is read from on an archive medium, and the digital video signal playback equipment which reproduces an image is explained.

[0075]Drawing 11 is a block diagram showing the composition of the digital video signal playback equipment in working example 3 of this invention. In this figure, identical codes are attached about the portion the same as that of working example 1 of drawing 1, or considerable. 15 is an error correction circuit and 16 is a frame memory.

[0076]Next, operation of this playback equipment is explained. The archive media 1 are recording media, such as an optical disc. Block in the block which are 8 pixels x eight lines, and frequency conversion of the picture information is carried out to the archive medium 1 by DCT, it is quantized, and high efficiency coding is carried out to it by variable-length-coding processing here, It is recorded as a video signal with which the address information in the error correcting code and the frame unit was added. In this case, on the archive medium 1, as shown in drawing 12, header information, such as address information, is recorded on the head of each frame. However, since it is the same as the thing of a conventional example about processing of frequency conversion, DCT, variable length coding, etc., those explanation is omitted.

[0077]It is read by the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 15. In the error correction circuit 15, error correction processing of the data to which it restored is carried out, and it separates into picture information and the address information in a frame unit. In the control circuit 4, according to the address information in the frame unit inputted, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head to the information detecting circuit 2 in the position in which the data read to the next is stored is generated.

[0078]In the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by this control circuit 4 to read continuously the picture information currently recorded on the optical disc. On the other hand, in the case of fast reproduction, it plays by reading the picture information for one frame from an optical disc every 15 frames, for example. Then, in the control circuit 4, the optical head of the information detecting circuit 2 is controlled, first, an address jump is carried out, the data for one frame is read to the head of a frame, and if it is completed, operation which is jumped at the head of the frame of 15-frame beyond will be repeated.

[0079]However, when reading the video signal recorded there from an optical disc etc., the latency speed of an optical disc until an optical head moves to the target point arises. In order to search the start address of a frame, when much time is spent, it becomes impossible therefore, to read no data for one frame from an optical disc by within a time [ of one frame ].

[0080]In such a case, the screen outputted now is frozen, and a reproducing output is updated when read-out of the data outputted to the next is completed. However, the freeze and updating of a screen are performed synchronizing with a frame signal. That is, the address jump on an optical disc is performed synchronizing with a frame signal, and an address jump is performed according to the frame pulse after reading all the data from an optical disc.

[0081]It is inputted into the variable length decoding circuit 5 by the error correction circuit 15 about the address information on an optical disc, and the separated picture information. Here, since it is the same as the digital video playback equipment of a conventional example about operation of the variable length decoding circuit 5 and the IDCT circuit 6, those explanation is omitted.

[0082]Here, the frame memory 16 is constituted by the frame memory for two frames, records the video signal inputted by the block unit of 8 pixels x eight lines by one frame, and outputs it per line. In this case, the change of the frame memory which records picture information, and the frame memory 16 to read is performed synchronizing with a frame signal. However, when read-out of the picture information for one screen from an optical disc is not completed to within a time [ of one frame ], the change of the frame memory 16 is stopped. Therefore, the screen outputted now will be frozen until the data for one screen is recorded.

[0083]The selection circuitry 11 chooses from the memory circuit 9 the picture information outputted synchronizing with a frame signal at the time of ordinary reproduction, and outputs it to the output terminal 12. On the other hand, at the time of fast reproduction, the output of the memory circuit 9 chooses the picture information by which filtering was carried out in the postfilter circuit 10, and it outputs from the output terminal 12.

[0084]Here, when a digital video signal is coded at the rate of 5 or less Mbps, block distortion occurs in the reproduced image. In the case of ordinary reproduction, this block distortion cannot check on vision, but when a screen is frozen, block distortion can check it clearly. Therefore, when a reproducing output is frozen at the time of fast reproduction, the block distortion of a reproduced image is known clearly.

[0085]For this reason, the block distortion of a reproduced image is reduced by giving a low pass filter per 1 screen by the postfilter circuit 10 at the time of fast reproduction. In this case, although the resolution of a reproduced image falls with a low pass filter, it is not more subjectively [ than the reproduced image with which unnatural block distortion is conspicuous ] more unsightly than the picture to which resolution fell as a reproduced image at the time of fast reproduction. That is, the fast reproduction in which block distortion is not conspicuous is realizable by giving a postfilter per screen to the reproduced image at the time of fast reproduction. Here, since it is the same as working example 1 about operation of the postfilter circuit 10, the explanation is omitted.

[0086]Although picture information was read per frame from the archive medium 1 in above-mentioned working example 3 at the time of fast reproduction, It is not necessary to be necessarily an one-frame unit for example, as shown in drawing 13, one screen is divided into five area of the area 1-5, and it begins to read one area at a time, and may be made to decode

from one frame. In this case, the picture information of the field of the area 1 is read from the 1st frame, the picture information of the field of the area 2 is read from the 2nd frame, each picture information of the field of the area 3, 4, and 5 is read from 3 and the 4 or 5th frame like the following, respectively, and the data for one screen is compounded. However, five frames outputted do not necessarily need to be continuation frames, and may be several frame intervals.

[0087]Although the data for fast reproduction is separated from the data for ordinary reproduction and not being recorded on an optical disc in above-mentioned working example 3, The same effect is done so also in the system which records the low-pass ingredient of a DCT coefficient on the data and another area for ordinary reproduction on a disk as data for fast reproduction as shown in working example 2.

[0088]Although explained in above-mentioned working example 3 that the archive medium 1 is an optical disc, it is not necessary to be necessarily an optical disc, and recording media, such as magnetic tape, may be used.

[0089]

[Effect of the Invention]Since according to the digital video signal playback equipment concerning the invention of Claim 1 a postfilter is given per screen and the reproduced image is outputted, after reading and decoding only some fields or the picture information of a frame at the time of special reproduction, Block distortion cannot be easily conspicuous when a screen is frozen especially at the time of special reproduction.

[0090]Since according to the digital video signal playback equipment concerning the invention of Claim 2 a postfilter is given per screen and it outputs as a reproduced image after reading and decoding only the picture information of I picture at the time of special reproduction, block distortion cannot be easily conspicuous when a screen is frozen especially at the time of special reproduction.

[0091]After according to the digital video signal playback equipment concerning the invention of Claim 3 reading only the data for special reproduction from area different from the data for ordinary reproduction and decoding it at the time of special reproduction, Since a postfilter is given per screen and it outputs as a reproduced image, block distortion of a special reproduction picture cannot be easily conspicuous.

[0092]After according to the digital video signal playback equipment concerning the invention of Claim 4 reading a part of I picture of the picture information from area different from the data for ordinary reproduction as data for special reproduction and decoding it at the time of special reproduction, Since a postfilter is given per screen and it outputs as a reproduced image, block distortion of a special reproduction picture cannot be easily conspicuous.

[0093]Since according to the digital video signal playback equipment concerning the invention of Claim 5 a postfilter is given per screen and it outputs as a reproduced image after reading and decoding a part of picture information at the time of special reproduction, block distortion cannot be easily conspicuous when a screen is frozen especially at the time of special reproduction.

[0094]according to the digital video signal playback equipment concerning the invention of Claim 6 -- the data for [ time of special reproduction ] special reproduction -- Eliau different

from the data for ordinary reproduction, after carrying out reading appearance clitteringly and decoding, Since a postfilter is given per screen and it outputs as a reproduced image, block distortion of a special reproduction picture cannot be easily conspicuous.

## TECHNICAL FIELD

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[Industrial Application] This invention relates to the digital video signal playback equipment which plays the coded digital video signal which is recorded on archive media, such as an optical disc and magnetic tape.

## PRIOR ART

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[Description of the Prior Art] There is a hybrid coding method which combined prediction coding between pictures using motion compensation prediction as one of the low bit rate coding methods in the case of coding a video signal and the conversion coding within a picture.

Drawing 14 is a block circuit diagram showing an example of the conventional digital video signal playback equipment constituted according to ISO-IEC/JTC1/SC29/WG11 MPEG92/N0245 Test Model 2 of CCITT. In this conventional example, the video signal coded by this hybrid coding method is recorded also on the archive media 1, such as an optical disc and magnetic tape.

[0003] In drawing 14, the video signal currently recorded on the archive medium 1 is read one by one by the information detecting circuit 2, and is inputted into the error correction circuit 3. The output of the error correction circuit 3 is inputted into the control circuit 4, and controls the information detecting circuit 2 by the control circuit 4. On the other hand, the output of the error correction circuit 3 is inputted also into the variable length decoding circuit 5, a reverse discrete cosine transform is given in the IDCT circuit 6, and the output is given as the 1st input to the adding machine 8. The output of the error correction circuit 3 is inputted also into the prediction data decoder circuit 7, and the output of the prediction data decoder circuit 7 is given as the 2nd input to the adding machine 8. The added result in the adding machine 8 is outputted from the output terminal 12 via the memory circuit 9.

[0004] Drawing 15 is a block diagram showing the coding equipment for coding a digital video signal. The digital video signal reproduced in conventional digital video signal playback equipment is recorded on the archive medium 1 as coding data by the system as shown in drawing 15. In drawing 15, the digital video signal inputted from the input terminal 80 is first inputted into the memory circuit 81. The video signal 92a outputted from the memory circuit 81 is given as the 1st input to the subtractor 82, and the 2nd input to the motion compensation prediction circuit 90. The output of the subtractor 82 is inputted into the quantization circuit 84 via DCT circuit 83. The output of the quantization circuit 84 is inputted into the error correction circuit 86 via the variable-length-coding circuit 85. Digital modulation is given by the modulation circuit 91 and the output of the error correction circuit 86 is recorded on the archive

medium 1 as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT (discrete cosine transform).

[0005]On the other hand, the output of the quantization circuit 84 is inputted also into the IDCT circuit 88 via the inverse quantizing circuit 87. The output of the IDCT circuit 88 is given as the 1st input to the adding machine 89. The picture information 93a which is an added result of the adding machine 89 is given as the 1st input to the motion compensation prediction circuit 90. The estimated image information 94a which is an output of the motion compensation prediction circuit 90 is given as the 2nd input to the adding machine 89, and the 2nd input to the subtractor 82.

[0006]Drawing 16 is a block circuit diagram showing an example of the motion compensation prediction circuit 90 in the coding equipment of a digital video signal. In a figure, the video signal 92a of the memory circuit 81 is given to the input terminal 92, and the picture information 93a from the adding machine 89 is given to the input terminal 93, respectively. The picture information 93a inputted from the input terminal 93 is inputted into the frame memory 95a or the frame memory 95b via the change machine 95. The image comparison outputted from the frame memory 95a is given as the 1st input to the motion vector detection circuit 96a. The video signal 92a inputted from the input terminal 92 is given to the 2nd input of the motion vector detection circuit 96a. The output of the motion vector detection circuit 96a is inputted into the prediction mode selector 97.

[0007]On the other hand, the image comparison outputted from the frame memory 95b is given as the 1st input to the motion vector detection circuit 96b. The video signal 92a inputted from the input terminal 92 is given to the 2nd input of the motion vector detection circuit 96b. The output of the motion vector detection circuit 96b is given as the 2nd input to the prediction mode selector 97.

[0008]The video signal 92a inputted from the input terminal 92 is given to the 3rd input of the prediction mode selector 97. The 1st output of the prediction mode selector 97 is given as the 1st input to the change machine 98. Zero signal is given to the 2nd input of the change machine 98. As the 3rd input to the change machine 98, the 2nd output of the prediction mode selector 97 is given. The output of the change machine 98 is outputted from the output terminal 94 as the estimated image information 94a.

[0009]Next, the encoding operation in the coding equipment of the digital video signal of drawing 15 is explained. First, an outline is explained about the video signal part by which prediction coding between pictures is carried out among the video signals recorded by the hybrid coding method which combined prediction coding between pictures using motion compensation prediction, and the conversion coding within a picture.

[0010]Drawing 17 is a key map showing the motion compensation prediction in a coding video signal method. Drawing 18 is a key map showing operation of the memory circuit 81 in a coding video signal method.

[0011]The coded image from which each of a series of picture information was changed in the picture in drawing 17. (It is hereafter called I picture.) It is divided into the picture information of

three types of I, uni-directional prediction-coding picture (henceforth P picture)  $P_1 - P_4$ , and both-directions prediction-coding picture (henceforth B picture)  $B_1 - B_{10}$ . For example, when the picture of one sheet is made into I picture at N sheets and one sheet considers it as P picture or I picture at M sheets, n and m as an integer and  $1 \leq m \leq N/M$ ,  $(N \times n + M)$  As for the picture of eye watch, the picture (m!=1) of I picture and eye watch  $(N \times n + M \times m)$  makes B picture the picture of P picture and eye watch  $(N \times n + M \times m + 1)$   $(N \times n + M \times m + M - 1)$  to eye watch. At this time, from the picture  $(N \times n + N)$  of eye watch  $(N \times n + 1)$  to the picture of eye watch is collectively called GOP (Group of Pictures).

[0012]Here, GOP in  $N = 15$  and  $M = 3$  is shown in drawing 17. In a figure, I picture does not perform prediction between pictures, but performs only conversion coding within a picture. P picture performs prediction from last I picture or P picture. For example, although the 6th picture is P picture among a figure, this performs prediction from 3rd I picture. 9th P picture is predicted from 6th P picture among a figure. B picture is predicted from I picture or P picture of just before and an immediately after. For example, the 4th and 5th B picture will be predicted from the both sides of 3rd I picture and 6th P picture among a figure. Therefore, the 4th and the 5th picture are coded after coding the 6th picture information.

[0013]Drawing 15 is coding equipment for coding the digital video signal of such a hybrid coding method, and the digital video signal inputted from the input terminal 1 is inputted into the memory circuit 81. In the memory circuit 81, picture information is rearranged into encoding order and outputted. That is, since 1st B picture is coded after 3rd I picture in drawing 17 as stated previously, picture information is rearranged here.

[0014]Operation of rearrangement of the picture information in such a memory circuit 81 is shown in drawing 18. The image sequence inputted like drawing 18 (a) is outputted in order of drawing 18 (b). In order that the video signal 92a outputted from the memory circuit 81 may drop the relative redundancy of a time base direction, after difference is taken between picture information with the estimated image information 94a outputted from the motion compensation prediction circuit 90 with the subtractor 82, DCT is given to space shaft orientations in DCT circuit 83. It is quantized in the quantization circuit 84 and the coefficient (DCT coefficient) of the picture information by which DCT transformation was carried out is further inputted into the variable-length-coding circuit 85. In the variable-length-coding circuit 85, variable length coding of the quantized DCT coefficient and the motion vector information is carried out, header information, such as address information, is added, and it is inputted into the error correction circuit 86.

[0015]In the error correction circuit 86, error correction processing is performed to the picture information inputted, and it outputs to the modulation circuit 91. In the modulation circuit 91, digital modulation of the picture information is carried out, and it records on the archive media 1, such as an optical disc.

[0016]On the other hand, after inverse quantization of the conversion factor quantized by the quantization circuit 84 is carried out in the inverse quantizing circuit 87 and IDCT is given further in the IDC circuit 88, it is added with the estimated image information 94a with the

adding machine 89, and the picture information 93a of a decoded image is called for. This picture information 93a is inputted into the motion compensation prediction circuit 90 for coding of the following picture.

[0017]Next, operation of the motion compensation prediction circuit 90 is explained according to each block of drawing 16. In the motion compensation prediction circuit 90, motion compensation prediction of the video signal 92a outputted from the memory circuit 81 is carried out using the picture information of two image comparisons memorized by the frame memory 95a and the frame memory 95b, and the estimated image information 94a is outputted.

[0018]First, when the picture information 93a which was coded as mentioned above and decoded is I picture or P picture, this picture information 93a is memorized by the frame memory 95a or the frame memory 95b for coding of the following image. The change machine 95 is changed so that the direction previously updated in time among the frame memory 95a and the frame memory 95b may be chosen at this time. When the decoded picture information 93a is B picture, the writing to the frame memory 95a and the frame memory 95b is not performed.

[0019]When the 1st of drawing 17 and 2nd B picture are coded by such change, for example, 0th P picture and 3rd I picture are memorized by the frame memory 95a and the frame memory 95b, respectively.

Then, if 6th P picture is coded and decoded, the frame memory 95a will be rewritten by the decoded image of 6th P picture.

[0020]Therefore, when the following 4th and 5th B picture are coded, 6th P picture and 3rd I picture are memorized by the above-mentioned frame memory 95a, respectively. If 9th P picture is coded and decoded, the frame memory 95b will be rewritten by the decoded image of 9th P picture. Therefore, when the 7th and 8th B picture are coded, 6th P picture and 9th P picture are memorized by the above-mentioned frame memory 95b, respectively.

[0021]If the video signal 92a outputted from the memory circuit 81 is inputted into the motion compensation prediction circuit 90, based on the image comparison memorized by the frame memories 95a and 95b, the two motion vector detection circuits 96a and 96b will detect a motion vector, and will output a motion-compensation-prediction picture, respectively. Namely, divide the video signal 92a into two or more image blocks, and about each image block. While choosing the image block that prediction distortion becomes small most in an image comparison and outputting the relative location of that image block as a motion vector, it is outputting from the output terminal 94 by making this image block into a motion-compensation-prediction picture.

[0022]On the other hand, among two motion-compensation-prediction pictures outputted from the motion vector detection circuits 96a and 96b, and these average pictures, prediction distortion chooses the smallest thing and outputs the prediction mode selector 97 as an estimated image. If the video signal 92a is not a thing about B picture at this time, the motion-compensation-prediction picture equivalent to the image comparison inputted previously in time will always be chosen, and will be outputted from the output terminal 94.

[0023]In the prediction mode selector 97, picture information with the sufficient encoding

efficiency among the formation of a picture inner code which does not predict, and prediction coding between pictures by the selected estimated image is chosen. Picture inner code-ization will be chosen whenever the video signal 92a is I picture at this time. When the signal which shows the picture inner code-ized mode when picture inner code-ization is chosen is outputted as prediction mode and prediction coding between pictures is chosen, the signal which shows the selected estimated image is outputted as prediction mode. The change machine 98 outputs the estimated image which it will output zero signal if the prediction mode outputted from the prediction mode selector 97 is the picture inner code-ized mode, otherwise, is outputted from the prediction mode selector 97.

[0024]From the above thing, since the motion compensation prediction circuit 90 always outputs zero signal as the estimated image information 94a when the video signal 92a outputted from the memory circuit 81 is I picture, conversion coding within a picture is carried out [ not performing prediction between pictures ] about the picture information of I picture. the time of the video signal 92a outputted from the memory circuit 81 being 6th P picture of drawing 17, for example - the motion compensation prediction circuit 90 -- the 3rd of drawing 17 -- I picture lost-motion compensation prediction is carried out, and the estimated image information 94a is outputted. the time of the video signal 92a outputted from the memory circuit 81 being 4th B picture of drawing 17, for example -- the motion compensation prediction circuit 90 -- 3rd I picture of drawing 17, and the 6th -- P picture lost-motion compensation prediction is carried out, and the estimated image information 94a is outputted.

[0025]Next, operation of the digital video signal playback equipment constituted like drawing 14 is explained. It is read to the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 3. In the error correction circuit 3, error correction processing of the digital video signal inputted is carried out, and it separates into picture information and motion vector information, and address information. And address information is outputted to the control circuit 4. In the control circuit 4, according to the inputted address information, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head in the position in which the data read to the next is stored is generated.

[0026]Here, in the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by the control circuit 4 to read continuously the data currently recorded on the optical disc. On the other hand, in the case of fast reproduction, there is the method of reading only for example, I picture and reproducing. In this case, in the control circuit 4, the optical head of the information detecting circuit 2 is controlled, an address jump is carried out at the head of I picture, and if read-out of the picture information of I picture is completed, the operation jumped at the head of the following I picture will be repeated.

[0027]However, in order to search the start address of the case where there is much amount of information of I picture, or I picture, when much time is spent, no I pictures can be read from archive media, such as an optical disc, by within a time [ of one frame ]. In such a case, the

screen outputted now is frozen, and a reproducing output is updated when read-out of the picture information of the following I picture is completed.

[0028]On the other hand, the picture information separated by the error correction circuit 3 is changed into fixed length data from variable length data by the variable length decoding circuit 5, inverse quantization is further carried out, IDCT is given by the IDCT circuit 6 and it is supplied as the 1st input to the adding machine 8. On the other hand, in the prediction data decoder circuit 7, an estimated image is decoded according to the motion vector information outputted from the error correction circuit 3, and this is given as the 2nd input to the adding machine 8.

[0029]In this case, the prediction data decoder circuit 7 is provided with the frame memory which memorizes the picture information of I picture decoded by the adding machine 8 like the motion compensation prediction circuit 90, and P picture.

At the time of the input of P picture and B picture, an estimated image is reproduced from I picture which is applicable according to motion vector information, and P picture, and it is outputting to the adding machine 8.

About the updating method of the image comparison information on the time of the input of I picture and P picture, since it is the same as the case of the coding equipment of drawing 15, explanation is omitted.

[0030]In the adding machine 8, the output of the prediction data decoder circuit 7 and the output of the IDCT circuit 6 are added, and this added result is outputted to the memory circuit 9.

According to the order to code as shown in drawing 18 at the time of coding, the video signal inputted continuously in time is rearranged per frame as already explained. For this reason, in the memory circuit 9, the picture information of a frame unit inputted in the order shown in drawing 18 (b) is rearranged in order of drawing 18 (a), and it outputs from the output terminal 12 as picture information which continues in time. However, when reproducing only I picture at the time of fast reproduction, in the memory circuit 9, the data list substitute by a picture unit is not performed.

## EFFECT OF THE INVENTION

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[Effect of the Invention]Since according to the digital video signal playback equipment concerning the invention of Claim 1 a postfilter is given per screen and the reproduced image is outputted, after reading and decoding only some fields or the picture information of a frame at the time of special reproduction, Block distortion cannot be easily conspicuous when a screen is frozen especially at the time of special reproduction.

[0090]Since according to the digital video signal playback equipment concerning the invention of Claim 2 a postfilter is given per screen and it outputs as a reproduced image after reading and decoding only the picture information of I picture at the time of special reproduction, block distortion cannot be easily conspicuous when a screen is frozen especially at the time of special reproduction.

[0091]After according to the digital video signal playback equipment concerning the invention of

Claim 3 reading only the data for special reproduction from area different from the data for ordinary reproduction and decoding it at the time of special reproduction, Since a postfilter is given per screen and it outputs as a reproduced image, block distortion of a special reproduction picture cannot be easily conspicuous.

[0092]After according to the digital video signal playback equipment concerning the invention of Claim 4 reading a part of I picture of the picture information from area different from the data for ordinary reproduction as data for special reproduction and decoding it at the time of special reproduction, Since a postfilter is given per screen and it outputs as a reproduced image, block distortion of a special reproduction picture cannot be easily conspicuous.

[0093]Since according to the digital video signal playback equipment concerning the invention of Claim 5 a postfilter is given per screen and it outputs as a reproduced image after reading and decoding a part of picture information at the time of special reproduction, block distortion cannot be easily conspicuous when a screen is frozen especially at the time of special reproduction.

[0094]according to the digital video signal playback equipment concerning the invention of Claim 6 -- the data for [ time of special reproduction ] special reproduction -- Eliau different from the data for ordinary reproduction, after carrying out reading appearance clitteringly and decoding, Since a postfilter is given per screen and it outputs as a reproduced image, block distortion of a special reproduction picture cannot be easily conspicuous.

## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]Conventional digital video signal playback equipment is constituted as mentioned above, and when performing fast reproduction using I picture, after it detects the head part of GOP from on the bit stream currently recorded on archive media, such as an optical disc, it will read the data of I picture. For this reason, when the data volume of I picture became very large, or when much time is required in order to search the head part of GOP, a reproducing output is frozen until it reads all picture information from archive media, such as an optical disc. However, when the reproduced image coded with the low rate was frozen, there was a problem that distortion between two or more image blocks which constitute one screen was conspicuous.

[0032]It aims at obtaining the digital video signal playback equipment with which block distortion is not conspicuous at the time of special reproduction, this invention having been made for the purpose of canceling the above problems, and applying a postfilter to a reproduced image at the time of special reproduction.

## MEANS

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[Means for Solving the Problem]Digital video signal playback equipment which this invention requires for an invention of Claim 1, A digital video signal recorded as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT is

read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes some the fields or frames of said picture information from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal read by said decoding means.

[0034]Digital video signal playback equipment concerning an invention of Claim 2 decodes only a coded image (henceforth I picture) changed from on said archive medium in an image of said picture information in said decoding means.

[0035]Digital video signal playback equipment which this invention requires for an invention of Claim 3, As data for special reproduction, a part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT, A digital video signal recorded on area different from data used only at the time of ordinary reproduction is read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a special reproduction picture read from said decoding means.

[0036]Digital video signal playback equipment concerning an invention of Claim 4 is recorded on said archive medium as data for special reproduction in a part of I picture of said picture information.

[0037]Digital video signal playback equipment which this invention requires for an invention of Claim 5 reads a digital video signal recorded as picture information by which high efficiency coding was carried out using orthogonal transformation from on an archive medium, and is characterized by that digital video signal playback equipment which reproduces an image comprises the following.

A decoding means which decodes said a part of digital video signal from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal decoded by said decoding means.

[0038]Digital video signal playback equipment which this invention requires for an invention of Claim 6, As data for special reproduction, a part of picture information by which high efficiency coding was carried out using orthogonal transformation, A digital video signal recorded on area different from data used only at the time of ordinary reproduction is read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a special reproduction image decoded by said decoding means.

## OPERATION

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[Function]In the digital video signal playback equipment concerning the invention of Claim 1. After reading and decoding some fields or the picture information of a frame at the time of special reproduction from the archive medium on which the picture information by which high efficiency coding was carried out using motion compensation prediction and DCT was recorded, a postfilter is given per screen, Since it outputs as a reproduced image, block distortion cannot be easily conspicuous when a special reproduction picture is frozen.

[0040]In the digital video signal playback equipment concerning the invention of Claim 2. Since the postfilter was given per screen after reading and decoding only the picture information of I picture at the time of special reproduction from the archive medium on which the picture information by which high efficiency coding was carried out to motion compensation prediction using DCT was recorded, block distortion cannot be easily conspicuous when a special reproduction image is frozen.

[0041]In the digital video signal playback equipment concerning the invention of Claim 3. From the archive medium on which the data for special reproduction by which high efficiency coding was carried out using motion compensation prediction and DCT was recorded, Since a postfilter is given per screen and it outputs as a reproduced image after reading only the data for special reproduction from area different from the data for ordinary reproduction and decoding it at the time of special reproduction, block distortion of a special reproduction image cannot be easily conspicuous.

[0042]In the digital video signal playback equipment concerning the invention of Claim 4. Since a part of I picture of the picture information is recorded as data for special reproduction on the archive medium, After reading a part of I picture of the picture information from area different from the data for ordinary reproduction as data for special reproduction and decoding it at the time of special reproduction, a postfilter is given per screen and it can output as a reproduced image.

[0043]In the digital video signal playback equipment concerning the invention of Claim 5. Since a postfilter is given per screen and it outputs as a reproduced image, after reading and decoding a part of picture information at the time of special reproduction from the archive medium on which the picture information by which high efficiency coding was carried out using orthogonal transformation was recorded, Block distortion etc. cannot be easily conspicuous when a special reproduction picture is frozen.

[0044]According to the digital video signal playback equipment concerning the invention of

Claim 6, from the archive medium on which the data for special reproduction by which high efficiency coding was carried out using orthogonal transformation was recorded, the data for [ time of special reproduction ] special reproduction -- Elia different from the data for ordinary reproduction -- since a postfilter is given per screen and it outputs as a reproduced image after carrying out reading appearance cluttering and decoding, block distortion of a special reproduction image cannot be easily conspicuous.

## EXAMPLE

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[Example]

Below working example 1, describes working example 1 of this invention with reference to the attached Drawings. Drawing 1 is a block diagram showing the composition of the digital video signal playback equipment of working example 1 of this invention. In drawing 1, identical codes are attached about the portion the same as that of the conventional device of drawing 14, or considerable. The picture information currently recorded on the archive medium 1 is read by the information detecting circuit 2, carries out digital demodulation and is outputted to the error correction circuit 3. In the error correction circuit 3, error correction processing is performed per output of the information detecting circuit 2, and address information is outputted to the control circuit 4. According to the address information inputted, the information detecting circuit 2 is controlled by the control circuit 4. On the other hand, the output of the error correction circuit 3 is inputted also into the variable length decoding circuit 5, and is given as the 1st input to the adding machine 8 via the IDCT circuit 6. The motion vector information outputted from the error correction circuit 3 is inputted into the prediction data decoder circuit 7, and the output of the prediction data decoder circuit 7 is given as the 2nd input to the adding machine 8. The output of the adding machine 8 is inputted into the postfilter 10 and the selection circuitry 11 via the memory circuit 9. In the selection circuitry 11, either the output of the memory circuit 9 or output of the postfilter 10 is chosen, and it outputs from the output terminal 12.

[0046]Next, operation of the digital video signal playback equipment of working example 1 is explained. Drawing 2 is a key map for explaining the data array on the archive medium 1 in working example 1. This archive medium 1 is recording media, such as an optical disc. Motion compensation prediction of the digital video signal is carried out to the archive medium 1 here, DCT performs frequency conversion, the prediction error is quantized, and the video signal to which the address information in an error correcting code and GOP units was added is recorded to the picture information by which high efficiency coding was carried out by performing variable-length-coding processing. However, about a highly efficient encoding method, it is the same as the hybrid coding method (drawing 15) explained by the conventional example. Then, on the archive medium 1, although the detailed explanation is omitted, as shown in drawing 2, picture information is recorded by GOP units. The address information in GOP units, etc. are recorded on the header information in the head part of GOP of drawing 2, and picture information is recorded on it in the picture information of I picture below in the turn rearranged into the head as shown in drawing 18 (b).

[0047]It is read by the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 3. In the error correction circuit 3, error correction processing of the digital data to which it restored is carried out, and it separates into the address information, picture information, and motion vector information in GOP units. In the control circuit 4, according to the address information in the GOP units inputted, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head to the information detecting circuit 2 in the position in which the picture information read to the next is stored is generated.

[0048]In the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by this control circuit 4 to read continuously the picture information currently recorded on the optical disc. On the other hand, it plays by reading only the picture information of I picture currently recorded on the head of GOP as shown in drawing 2 from an optical disc in the case of fast reproduction. Then, in the above-mentioned control circuit 4, the optical head of the information detecting circuit 2 is controlled, first, an address jump is carried out, the picture information about I picture is read to the head of GOP, and if it is completed, operation which is jumped at the head of the next GOP will be repeated.

[0049]Here, if all the picture information about I picture can be read to within a time [ of one frame ] when GOP is constituted considering the picture information of 15 frames as a unit, as shown in drawing 17, 15X fast reproduction is realizable. However, since the code amount of a video signal is controlled by GOP units, the amount of information of I picture is not constant, and it changes for every GOP. When reading the video signal recorded there from an optical disc etc., latency speed for an optical head to move to the point of the purpose on an optical disc arises. In order to search the start address of the case where there is much amount of information of I picture, or I picture, when much time is spent, it becomes impossible therefore, to read the video signal about all the I pictures from an optical disc by within a time [ of one frame ].

[0050]In such a case, the screen outputted now is frozen until read-out of the picture information of I picture from the archive medium 1 under present execution is completed. However, the frieze and updating of a screen are performed synchronizing with a frame signal. That is, the address jump to the head of the next GOP is performed synchronizing with a frame signal, and an address jump is performed according to the frame pulse after reading all the I pictures from an optical disc.

[0051]The motion vector information separated by the error correction circuit 3 is inputted into the prediction data decoder circuit 7, and is inputted into the variable length decoding circuit 5 about picture information. Here, since it is the same as the digital video signal playback equipment of a conventional example about operation of the variable length decoding circuit 5, the IDCT circuit 6, the prediction data decoder circuit 7, and the adding machine 8, those explanation is omitted.

[0052]In the memory circuit 9, the video signal of a picture inputted by a block unit is outputted per line synchronizing with a frame signal. However, rearrangement in a frame unit is performed

according to the order which codes the video signal which continues in time at the time of coding as shown in drawing 18. For this reason, in the memory circuit 9, the picture information inputted in the order shown in drawing 18 (b) as an output of the adding machine 8 is rearranged so that the order of drawing 18 (a), i.e., picture information, may continue in time, and it is outputted from the output terminal 12. However, in order to reproduce only I picture at the time of fast reproduction, picture information in a picture unit is not rearranged by the memory circuit 9.

[0053]Therefore, the picture information of I picture outputted from the adding machine 8 at the time of fast reproduction is recorded on the frame memory in the memory circuit 9 per frame, and it outputs as picture information in sync with a frame signal. That is, the change of the frame memory which records picture information, and the frame memory to read is performed synchronizing with a frame signal. However, when read-out of I picture from an optical disc is not completed to within a time [ of one frame ], the change of the frame memory of memory circuit 9 inside is stopped. In this way, the screen outputted now can be frozen until the picture information of all the I pictures is recorded on the memory circuit 9. The selection circuitry 11 chooses from the memory circuit 9 the picture information outputted synchronizing with a frame signal at the time of ordinary reproduction, and outputs it to the output terminal 12. On the other hand, at the time of fast reproduction, the output of the memory circuit 9 chooses the picture information by which filtering was carried out in the postfilter circuit 10, and it outputs from the output terminal 12.

[0054]Here, when a digital video signal is coded at the rate of 5 or less Mbps, block distortion occurs in the reproduced image. Although it cannot check on vision from the image by which ordinary reproduction was carried out, when a screen is frozen, block distortion can check this block distortion clearly. Therefore, when I picture is frozen at the time of fast reproduction and it reproduces, the block distortion of a reproduced image is known clearly. For this reason, the block distortion of a reproduced image is reduced by giving a low pass filter per 1 screen by the postfilter circuit 10 at the time of fast reproduction. In this case, although the resolution of a reproduced image falls with a low pass filter, it is common for the reproduced image with which unnatural block distortion is conspicuous to be subjectively more unsightly than the picture to which resolution fell as a reproduced image at the time of fast reproduction. That is, the fast reproduction in which block distortion is not conspicuous is realizable by giving a postfilter per screen to the reproduced image at the time of fast reproduction.

[0055]Drawing 3 is a block diagram showing an example of this postfilter circuit 10. As shown here, the postfilter circuit 10 has given LPF to the perpendicular direction actually by vertical LPF32, after giving horizontal LPF by level LPF31 to the picture information inputted per line. Drawing 4 is a figure showing the frequency characteristic of the postfilter circuit 10 in working example 1. A multiplication coefficient is constituted by the multiplier of  $A0 = 0.603513641$ ,  $A1 = 0.25530132$ ,  $A2 = -0.05175682$ ,  $A3 = -0.00530132$  as this postfilter circuit 10 is shown in drawing 5 and drawing 6, The FIR filter of seven taps with the frequency characteristic shown in drawing 4 is used.

[0056]If level LPF31 is constituted as LPF of seven taps, it comes to be shown in drawing 5. That is, in drawing 5, the picture information inputted by six steps of flip-flop (FF)41-46 by which subordinate connection was carried out is delayed. And the picture information to which a multiplication coefficient becomes the same is added by the adding machines 47-49, respectively, and carries out the multiplication of the output of these adding machines 47-49, and the output of FF43 to a predetermined multiplication coefficient with the multipliers 50-53, The horizontal filter of seven taps is constituted by adding the result with the adding machine 54. Vertical LPF32 can be constituted as shown in drawing 6. That is, picture information is being delayed to the perpendicular direction by the six line memories 61-66. The picture information to which a multiplication coefficient becomes the same is added by the adding machines 67-69, respectively, and carries out the multiplication of the output of these adding machines 67-69, and the output of the line memory 63 to a predetermined multiplication coefficient with the multipliers 70-73, The vertical filter of seven taps is constituted by adding the result with the adding machine 74.

[0057]The address jump was carried out at the picture information of I picture currently recorded on the head of GOP at the time of fast reproduction, in above-mentioned working example, after read-out of I picture is completed, it has jumped to I picture of the next GOP, but the address jump to the next GOP may be performed per fixed time. That is, the picture information of I picture is read from the archive media 1, such as an optical disc, within the fixed time decided beforehand, and even if read-out of I picture is not completed in fixed time, an address jump is performed at the head of the next GOP. For this reason, only the picture information of the area which was able to be read from the archive medium 1 as shown in drawing 7 is updated, and a fast reproduction picture is reproduced. In this case, the boundary of the portion updated by the postfilter circuit 10 in the screen and the area which is not updated can be made not conspicuous.

[0058]Although the archive medium 1 was used as the optical disc in above-mentioned working example, it is not necessary to be necessarily an optical disc. The same effect can be acquired also about archive media, such as magnetic tape. Although LPF of seven taps is used as the postfilter 10 in above-mentioned working example, it is not necessary to be necessarily seven taps, and LPF can consist of arbitrary tap numbers.

[0059]Furthermore, in above-mentioned working example, although the picture information of the postfilter circuit 10 was chosen only at the time of fast reproduction, the postfilter circuit 10 can be used also at the times of other special reproduction, such as the time of slow reproduction and still playback, and block distortion can be reduced. When being outputted without freezing a reproduction screen also in the time of fast reproduction, the block distortion of a reproduced image stops being conspicuous. The selection circuitry 11 may be controlled so that it carries out and backlash does not give a postfilter in such a case.

[0060]moreover -- above-mentioned working example -- special reproduction -- every, although explained as what reads only I picture of GOP from a disk and is played, Even when performing fast reproduction by reproducing arbitrary pictures, such as P picture, block distortion can be similarly reduced using the postfilter circuit 10. It is not necessary to necessarily reproduce all

the I pictures from each GOP, and I picture may be reproduced only once per GOP number.

[0061]Working example 2 of this invention is described for working example 2. Ranking next. In the digital video signal playback equipment of working example 2. The data used only at the time of ordinary reproduction reads independently the digital video signal separated as data for special reproduction from on an archive medium, and he is trying for a part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT to reproduce it.

[0062]Drawing 8 is a block diagram showing the composition of the digital video signal playback equipment in working example 2 of this invention. In this figure, identical codes are attached about the portion the same as that of the device of drawing 1, or considerable. 13 is an error correction circuit, it carries out digital demodulation of the output of the information detecting circuit 2 here, performs error correction processing, and outputs it as picture information separated into address information, motion vector information, the data for special reproduction, and the data for ordinary reproduction from the archive media 1, such as an optical disc. 14 is a block data reconstruction circuit, at the time of ordinary reproduction, sets the data for special reproduction, and the data used only at the time of ordinary reproduction, and reconstructs block data here.

[0063]Operation of the digital video signal playback equipment constituted in this way is explained. A key map for drawing 9 to explain the data array on the archive medium 1 in working example 2 and drawing 10 are the key maps for explaining division of a DCT coefficient. The archive media 1 are recording media, such as an optical disc. Motion compensation prediction of the digital video signal is carried out to the archive medium 1 here, DCT performs frequency conversion, the prediction error is quantized, and the video signal to which the address information in an error correcting code and GOP units was added is recorded to the picture information by which high efficiency coding was carried out by performing variable-length-coding processing further. Among picture information, as shown in drawing 10, the low-pass portion and the high region portion of each other are separated, and the DCT coefficient of I picture is recorded on area where the data for ordinary reproduction is another considering the low-pass ingredient as data for special reproduction. In this case, the data for ordinary reproduction comprises a low-pass ingredient of I picture, and picture information of P picture and B picture. Therefore, in order to reproduce I picture at the time of ordinary reproduction, it is necessary to reconstruct the low-pass ingredient and high-frequency component which have been recorded on area different, respectively, and to decode the picture information of I picture.

[0064]The low-pass ingredient of I picture means here level and a vertical low-pass ingredient as shown as a field which contains for example, surrounds the important ingredient of picture information with the dashed line of drawing 10, when performing DCT by making 8 pixels x eight lines into unit block size. In this case, even if it decodes only using the low-pass ingredient shown in drawing 10, the contents of the image can be grasped enough. For this reason, image restoration can be performed only using six signals of the low-pass ingredient surrounded with

the dashed line of drawing 10 at the time of fast reproduction. If it carries out like this, since it is small compared with the amount of information of the picture information of the whole I picture, the amount of information of the low-pass ingredient of I picture can read all the I pictures by within a time [ of one frame ] at the time of fast reproduction.

[0065]It is read by the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 13. In the error correction circuit 13, error correction processing of the digital data to which it restored is carried out, and it separates into the picture information for ordinary reproduction, the picture information for fast reproduction, motion vector information, and the address information in GOP units. In the control circuit 4, according to the address information in the GOP units inputted, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head to the information detecting circuit 2 in the position in which the picture information read to the next is stored is generated.

[0066]In the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by this control circuit 4 to read continuously the picture information currently recorded on the optical disc. On the other hand, in the case of fast reproduction, only the data for fast reproduction (low-pass ingredient of I picture) currently recorded on the head of GOP as shown in drawing 9 is read from an optical disc, and it plays. Then, in the above-mentioned control circuit 4, the optical head of the information detecting circuit 2 is controlled, an address jump is carried out, the data for fast reproduction is read to the head of I picture, and if it is completed, operation which is jumped at the head of the next GOP will be repeated.

[0067]The motion vector information separated by the error correction circuit 13 is inputted into the prediction data decoder circuit 7, and is inputted into the block data reconstruction circuit 14 about the data for ordinary reproduction, and the data for fast reproduction. Since 1 Brock's coefficient is divided into the low-pass ingredient and the high-frequency component as shown in drawing 10, it is necessary to compound a low-pass ingredient and a high-frequency component by each block unit at the time of ordinary reproduction, and to reconstruct picture information about each block of I picture, here.

[0068]That is, in the block data reconstruction circuit 14, the data for fast reproduction which is a low-pass ingredient at the time of ordinary reproduction, and the data for ordinary reproduction which is high-frequency components are compounded, and the picture information for 1 Brock is reconstructed. On the other hand, at the time of fast reproduction, the picture information for 1 Brock is compounded in the block data reconstruction circuit 14 only using the data for fast reproduction which is a low-pass ingredient. The output of the block data reconstruction circuit 14 is inputted into the variable length decoding circuit 5, and is decoded as picture information one by one. Here, since it is the same as working example 1 about operation of the variable length decoding circuit 5, the IDCT circuit 6, the prediction data decoder circuit 7, the adding machine 8, and the memory circuit 9, those explanation is omitted.

[0069]The selection circuitry 11 chooses from the memory circuit 9 the picture information

outputted synchronizing with a frame signal at the time of ordinary reproduction, and outputs it to the output terminal 12. On the other hand, at the time of fast reproduction, the output of the memory circuit 9 chooses the picture information by which filtering was carried out in the postfilter circuit 10, and it outputs from the output terminal 12.

[0070]When the picture information which coded only the low-pass ingredient of each block as data for fast reproduction here lacks the high-frequency component of each block, block distortion may occur in the reproduced image. Therefore, the block distortion of a reproduced image is clearly known at the time of fast reproduction. For this reason, the block distortion of a reproduced image is reduced by giving a low pass filter per 1 screen by the postfilter circuit 10 at the time of fast reproduction.

[0071]In this case, although the resolution of a reproduced image falls with a low pass filter, it is common for the reproduced image with which unnatural block distortion is conspicuous to be subjectively more unsightly than the picture to which resolution fell as a reproduced image at the time of fast reproduction. That is, the fast reproduction in which block distortion is not conspicuous is realizable by giving a postfilter per screen to the reproduced image at the time of fast reproduction. Here, since it is the same as working example 1 about operation of the postfilter circuit 10, explanation is omitted.

[0072]Although the block data of I picture is divided into a low-pass ingredient and a high-frequency component and it was made to record on another area on an optical disc in above-mentioned working example 2, respectively, It may divide into a low-pass ingredient and high-frequency component other than the block data of I picture also about the block data of P picture, and the data for ordinary reproduction may be recorded on another area by using the former as fast reproduction data.

[0073]Although the block data of I picture was divided into the low-pass ingredient and the high-frequency component and each was recorded on another area on a disk in above-mentioned working example 2, As data for ordinary reproduction, it records without dividing into a low-pass ingredient and a high-frequency component, and it may be made to record only the low-pass ingredient of I picture on another area as data for special reproduction. If it carries out like this, it is not necessary to use the data for special reproduction only at the time of fast reproduction, and it does not need to reconstruct the low-pass ingredient and high-frequency component of I picture at the time of ordinary reproduction.

[0074]It explains referring to [ to working example 3. rank next ] drawing 11 thru/or drawing 13 for working example 3 of this invention. In working example 3, without using motion compensation prediction, the digital video signal recorded as picture information in which high efficiency coding was carried out by only DCT is read from on an archive medium, and the digital video signal playback equipment which reproduces an image is explained.

[0075]Drawing 11 is a block diagram showing the composition of the digital video signal playback equipment in working example 3 of this invention. In this figure, identical codes are attached about the portion the same as that of working example 1 of drawing 1, or considerable. 15 is an error correction circuit and 16 is a frame memory.

[0076]Next, operation of this playback equipment is explained. The archive media 1 are recording media, such as an optical disc. Block in the block which are 8 pixels x eight lines, and frequency conversion of the picture information is carried out to the archive medium 1 by DCT, it is quantized, and high efficiency coding is carried out to it by variable-length-coding processing here, It is recorded as a video signal with which the address information in the error correcting code and the frame unit was added. In this case, on the archive medium 1, as shown in drawing 12, header information, such as address information, is recorded on the head of each frame. However, since it is the same as the thing of a conventional example about processing of frequency conversion, DCT, variable length coding, etc., those explanation is omitted.

[0077]It is read by the information detecting circuit 2, digital demodulation etc. are performed, and the picture information recorded on the archive media 1, such as an optical disc, is outputted to the error correction circuit 15. In the error correction circuit 15, error correction processing of the data to which it restored is carried out, and it separates into picture information and the address information in a frame unit. In the control circuit 4, according to the address information in the frame unit inputted, the position of the optical head of the information detecting circuit 2 is checked, and the control signal for jumping an optical head to the information detecting circuit 2 in the position in which the data read to the next is stored is generated.

[0078]In the case of ordinary reproduction, after making the point which starts playback jump an optical head, it controls by this control circuit 4 to read continuously the picture information currently recorded on the optical disc. On the other hand, in the case of fast reproduction, it plays by reading the picture information for one frame from an optical disc every 15 frames, for example. Then, in the control circuit 4, the optical head of the information detecting circuit 2 is controlled, first, an address jump is carried out, the data for one frame is read to the head of a frame, and if it is completed, operation which is jumped at the head of the frame of 15-frame beyond will be repeated.

[0079]However, when reading the video signal recorded there from an optical disc etc., the latency speed of an optical disc until an optical head moves to the target point arises. In order to search the start address of a frame, when much time is spent, it becomes impossible therefore, to read no data for one frame from an optical disc by within a time [ of one frame ].

[0080]In such a case, the screen outputted now is frozen, and a reproducing output is updated when read-out of the data outputted to the next is completed. However, the frieze and updating of a screen are performed synchronizing with a frame signal. That is, the address jump on an optical disc is performed synchronizing with a frame signal, and an address jump is performed according to the frame pulse after reading all the data from an optical disc.

[0081]It is inputted into the variable length decoding circuit 5 by the error correction circuit 15 about the address information on an optical disc, and the separated picture information. Here, since it is the same as the digital video playback equipment of a conventional example about operation of the variable length decoding circuit 5 and the IDCT circuit 6, those explanation is omitted.

[0082]Here, the frame memory 16 is constituted by the frame memory for two frames, records

the video signal inputted by the block unit of 8 pixels x eight lines by one frame, and outputs it per line. In this case, the change of the frame memory which records picture information, and the frame memory 16 to read is performed synchronizing with a frame signal. However, when read-out of the picture information for one screen from an optical disc is not completed to within a time [ of one frame ], the change of the frame memory 16 is stopped. Therefore, the screen outputted now will be frozen until the data for one screen is recorded.

[0083]The selection circuitry 11 chooses from the memory circuit 9 the picture information outputted synchronizing with a frame signal at the time of ordinary reproduction, and outputs it to the output terminal 12. On the other hand, at the time of fast reproduction, the output of the memory circuit 9 chooses the picture information by which filtering was carried out in the postfilter circuit 10, and it outputs from the output terminal 12.

[0084]Here, when a digital video signal is coded at the rate of 5 or less Mbps, block distortion occurs in the reproduced image. In the case of ordinary reproduction, this block distortion cannot check on vision, but when a screen is frozen, block distortion can check it clearly. Therefore, when a reproducing output is frozen at the time of fast reproduction, the block distortion of a reproduced image is known clearly.

[0085]For this reason, the block distortion of a reproduced image is reduced by giving a low pass filter per 1 screen by the postfilter circuit 10 at the time of fast reproduction. In this case, although the resolution of a reproduced image falls with a low pass filter, it is not more subjectively [ than the reproduced image with which unnatural block distortion is conspicuous ] more unsightly than the picture to which resolution fell as a reproduced image at the time of fast reproduction. That is, the fast reproduction in which block distortion is not conspicuous is realizable by giving a postfilter per screen to the reproduced image at the time of fast reproduction. Here, since it is the same as working example 1 about operation of the postfilter circuit 10, the explanation is omitted.

[0086]Although picture information was read per frame from the archive medium 1 in above-mentioned working example 3 at the time of fast reproduction, It is not necessary to be necessarily an one-frame unit for example, as shown in drawing 13, one screen is divided into five area of the area 1-5, and it begins to read one area at a time, and may be made to decode from one frame. In this case, the picture information of the field of the area 1 is read from the 1st frame, the picture information of the field of the area 2 is read from the 2nd frame, each picture information of the field of the area 3, 4, and 5 is read from 3 and the 4 or 5th frame like the following, respectively, and the data for one screen is compounded. However, five frames outputted do not necessarily need to be continuation frames, and may be several frame intervals.

[0087]Although the data for fast reproduction is separated from the data for ordinary reproduction and not being recorded on an optical disc in above-mentioned working example 3, The same effect is done so also in the system which records the low-pass ingredient of a DCT coefficient on the data and another area for ordinary reproduction on a disk as data for fast reproduction as shown in working example 2.

[0088]Although explained in above-mentioned working example 3 that the archive medium 1 is

an optical disc, it is not necessary to be necessarily an optical disc, and recording media, such as magnetic tape, may be used.

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is a block diagram showing the digital video signal playback equipment of working example 1 of this invention.

[Drawing 2] It is a key map for explaining the data array on the archive medium in working example 1.

[Drawing 3] It is a block diagram showing the composition of the postfilter circuit in working example 1.

[Drawing 4] It is a figure showing the frequency characteristic of the postfilter circuit in working example 1.

[Drawing 5] It is a block diagram showing the composition of the level postfilter in working example 1.

[Drawing 6] It is a block diagram showing the composition of the vertical postfilter in working example 1.

[Drawing 7] It is a key map for explaining the special reproduction method in the modification of working example 1.

[Drawing 8] It is a block diagram showing the digital video signal playback equipment of working example 2 of this invention.

[Drawing 9] It is a key map for explaining the data array on the archive medium in working example 2.

[Drawing 10] It is a key map for explaining division of the DCT coefficient in working example 2.

[Drawing 11] It is a block diagram showing the digital video signal playback equipment of working example 3 of this invention.

[Drawing 12] It is a key map for explaining the data array on the archive medium in working example 3.

[Drawing 13] It is a key map for explaining the special reproduction method in the modification of working example 3.

[Drawing 14] It is a block diagram showing conventional digital video signal playback equipment.

[Drawing 15] It is a block diagram showing the coding equipment for coding a digital video signal.

[Drawing 16] It is a block diagram showing the motion compensation prediction circuit in the coding equipment of a digital video signal.

[Drawing 17] It is a key map for explaining the motion compensation prediction in a coding video signal method.

[Drawing 18] It is a key map for explaining operation of the memory circuit in a coding video

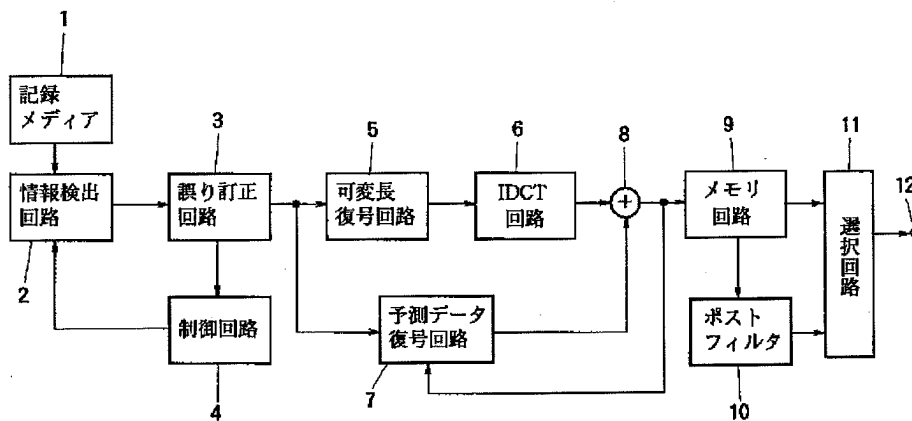
signal method.

[Description of Notations]

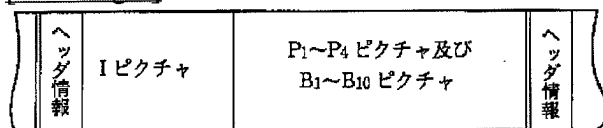
1 An archive medium and 2 [ A postfilter circuit and 11 / A selection circuitry and 12 / Output terminal. ] An information detecting circuit, 3 error correction circuits, and 4 A control circuit, five variable length decoding circuits, 6 IDCT circuit, 7 prediction-data decoder circuit, and 8 An adding machine, 9 memory circuits, and 10

## DRAWINGS

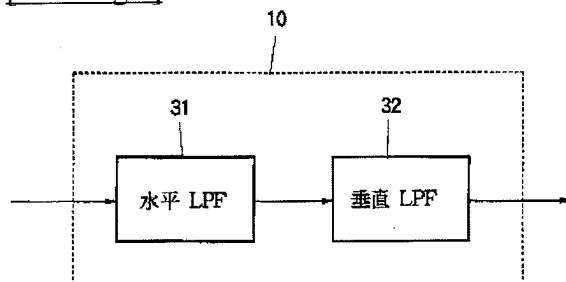
[Drawing 1]



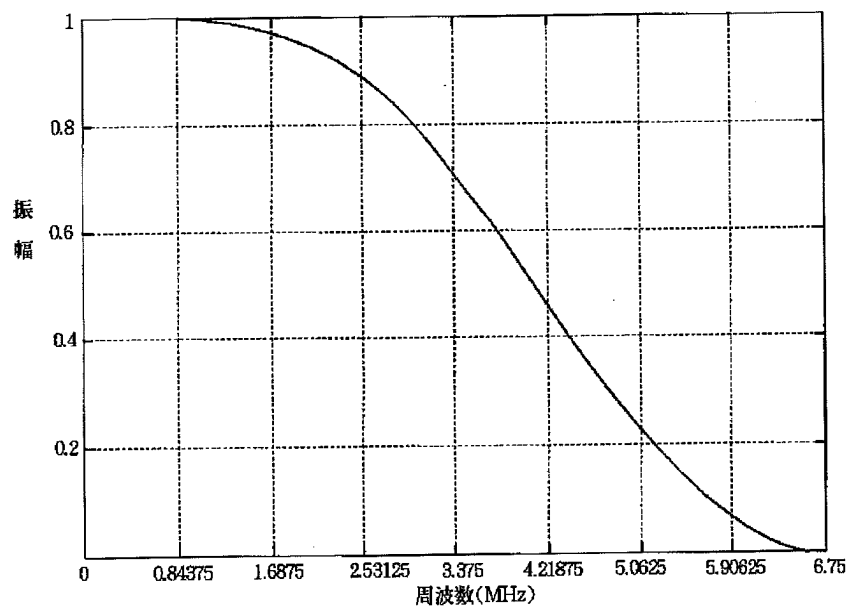
[Drawing 2]



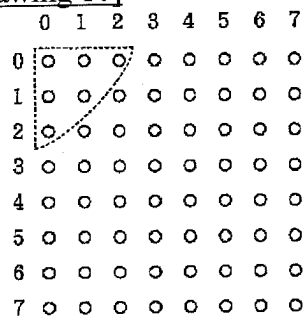
[Drawing 3]



[Drawing 4]



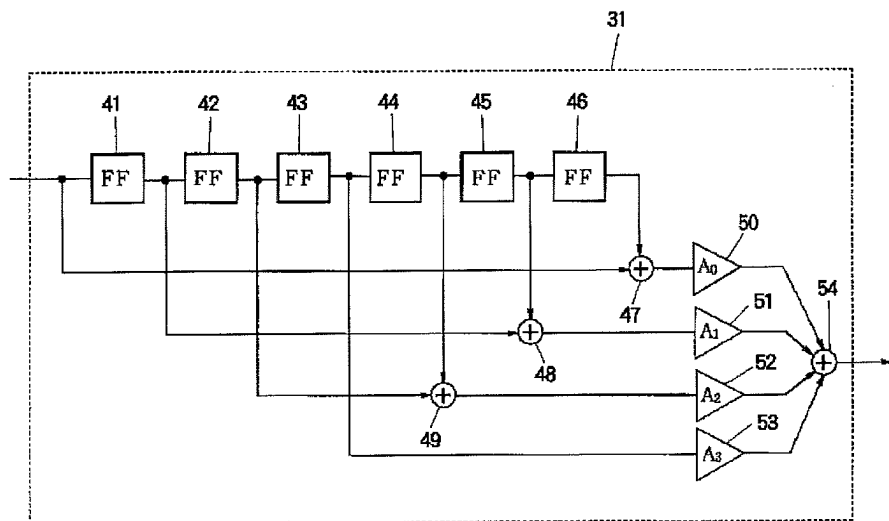
[Drawing 10]



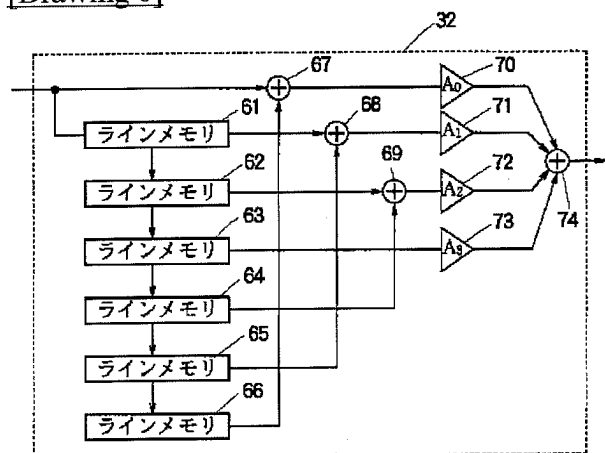
[Drawing 13]

エリア 1
エリア 2
エリア 3
エリア 4
エリア 5

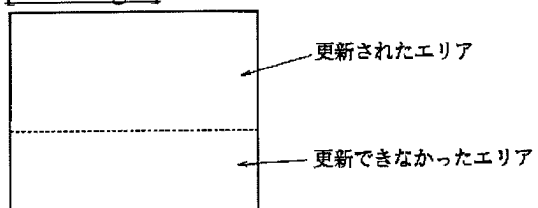
[Drawing 5]



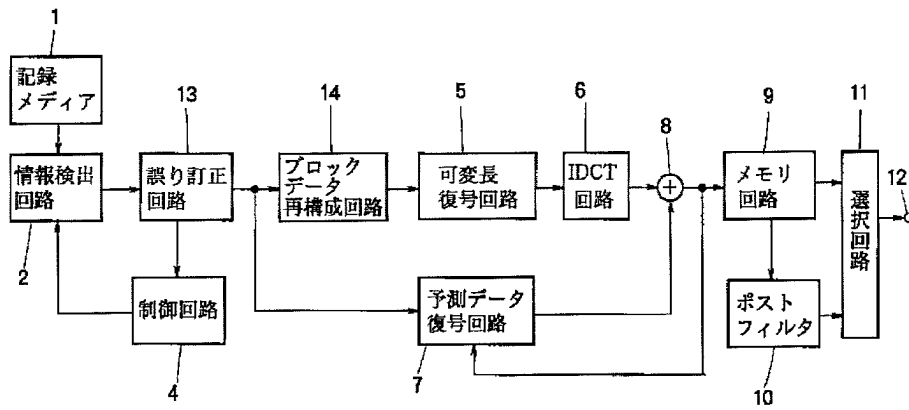
[Drawing 6]



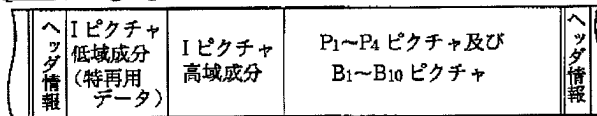
[Drawing 7]



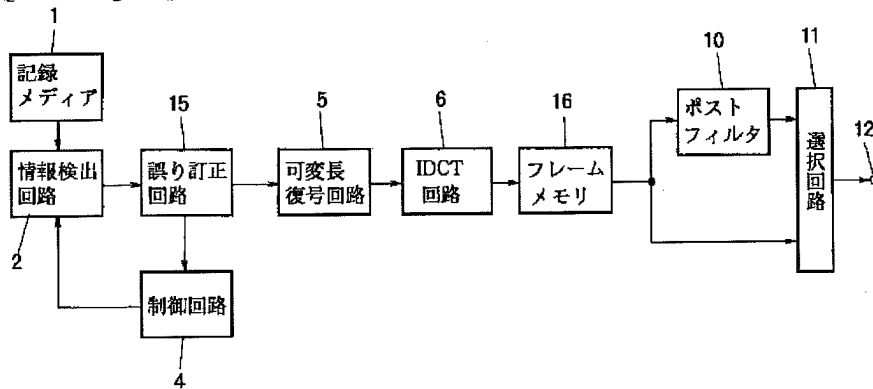
[Drawing 8]



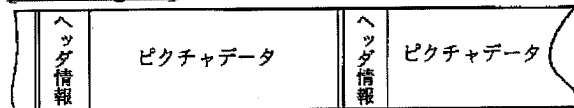
[Drawing 9]



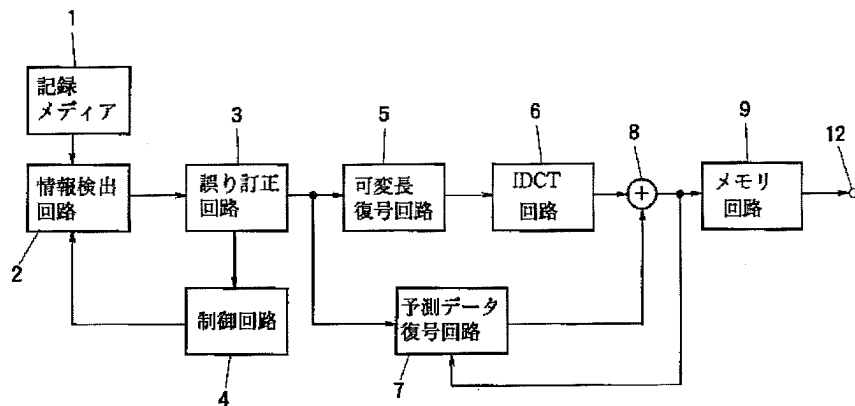
[Drawing 11]



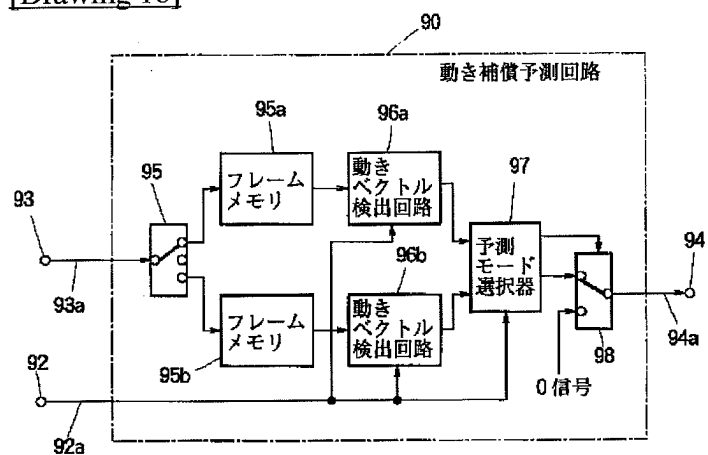
[Drawing 12]



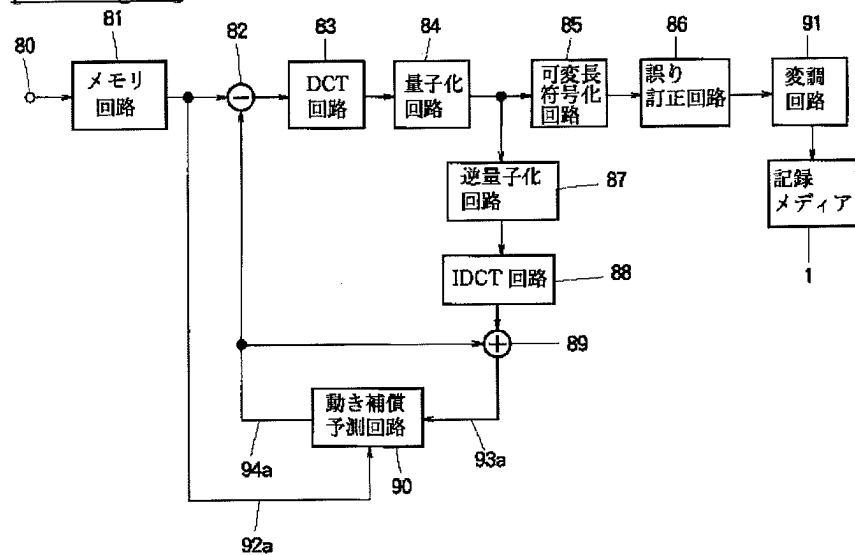
[Drawing 14]



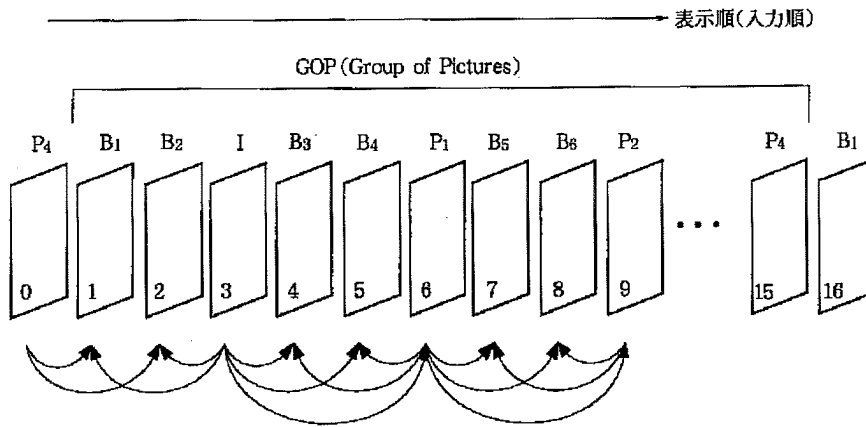
[Drawing 16]



[Drawing 15]

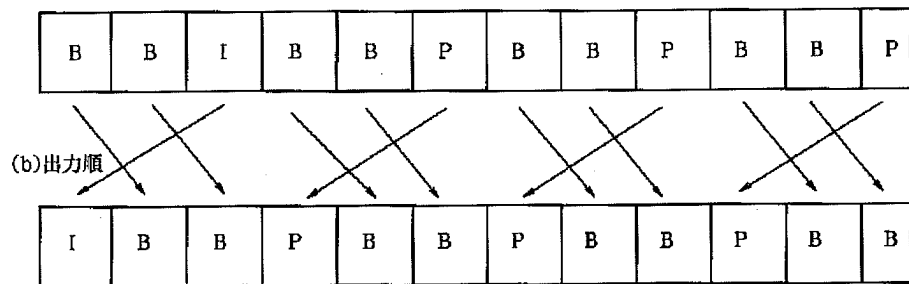


[Drawing 17]



[Drawing 18]

(a)入力順



## CORRECTION OR AMENDMENT

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5/76

5/93

7/32

[FI]

H04N 5/92 H

5/76 A

5/93 Z

7/137 Z

[Written Amendment]

[Filing date]Heisei 14(2002) March 20 (2002.3.20)

[Amendment 1]

[Document to be Amended]Description

[Item(s) to be Amended]Claims

[Method of Amendment]Change

[Proposed Amendment]

[Claim(s)]

[Claim 1]In digital video signal playback equipment which reads a digital video signal recorded as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT from on an archive medium, and reproduces an image,

A decoding means which decodes some the fields or frames of said picture information from on said archive medium at the time of special reproduction of an image,

A filter means which gives a postfilter per screen to a digital video signal decoded by said decoding means,

A selecting means which changes the above-mentioned postfilter

Digital video signal playback equipment characterized by preparation \*\*\*\*\*.

[Claim 2]The digital video signal playback equipment according to claim 1 decoding only a coded image (henceforth I picture) changed from on said archive medium in an image of said picture information in said decoding means.

[Claim 3]In digital video signal playback equipment which reads a digital video signal recorded on area where a part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT is different from data used only at the time of ordinary reproduction as data for special reproduction from on an archive medium, and reproduces an image,

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image,

A filter means which gives a postfilter per screen to a special reproduction image decoded by said decoding means,

A selecting means which changes the above-mentioned postfilter

Digital video signal playback equipment characterized by preparation \*\*\*\*\*.

[Claim 4]The digital video signal playback equipment according to claim 3, wherein a part of I picture of said picture information is recorded as data for special reproduction on said archive medium.

[Claim 5]In digital video signal playback equipment which reads a digital video signal recorded as picture information by which high efficiency coding was carried out using orthogonal transformation from on an archive medium, and reproduces an image,

A decoding means which decodes said a part of digital video signal from on said archive medium at the time of special reproduction of an image,

A filter means which gives a postfilter per screen to a digital video signal decoded by said decoding means

Digital video signal playback equipment characterized by preparation \*\*\*\*\*.

[Claim 6]In digital video signal playback equipment which reads a digital video signal recorded on area where a part of picture information by which high efficiency coding was carried out using orthogonal transformation is different from data used only at the time of ordinary reproduction as data for special reproduction from on an archive medium, and reproduces an image,

A decoding means which decodes only data for said special reproduction from on said archive medium at the time of special reproduction of an image,

A filter means which gives a postfilter per screen to a special reproduction image decoded by said decoding means

Digital video signal playback equipment characterized by preparation \*\*\*\*\*.

[Amendment 2]

[Document to be Amended]Description

[Item(s) to be Amended]0033

[Method of Amendment]Change

[Proposed Amendment]

[0033]

[Means for Solving the Problem]Digital video signal playback equipment which this invention requires for an invention of Claim 1, A digital video signal recorded as picture information by which high efficiency coding was carried out using motion compensation prediction and DCT is read from on an archive medium, and digital video signal playback equipment which reproduces an image is characterized by comprising the following:

A decoding means which decodes some the fields or frames of said picture information from on said archive medium at the time of special reproduction of an image.

A filter means which gives a postfilter per screen to a digital video signal read by said decoding means.

A selecting means which changes the above-mentioned postfilter.

[Amendment 3]

[Document to be Amended]Description

[Item(s) to be Amended]0035

[Method of Amendment]Change

[Proposed Amendment]

[0035]The digital video signal playback equipment which this invention requires for the invention of Claim 3, As data for special reproduction, a part of picture information by which high efficiency coding was carried out using motion compensation prediction and DCT, The digital video signal recorded on area different from the data used only at the time of ordinary reproduction is read from on an archive medium, and the digital video signal playback equipment which reproduces an image is characterized by comprising the following:  
The decoding means which decodes only the data for said special reproduction from on said archive medium at the time of the special reproduction of an image.  
The filter means which gives a postfilter per screen to the special reproduction picture read from said decoding means.  
The selecting means which changes the above-mentioned postfilter.

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	5/93			5/93	Z
	7/32			7/137	Z

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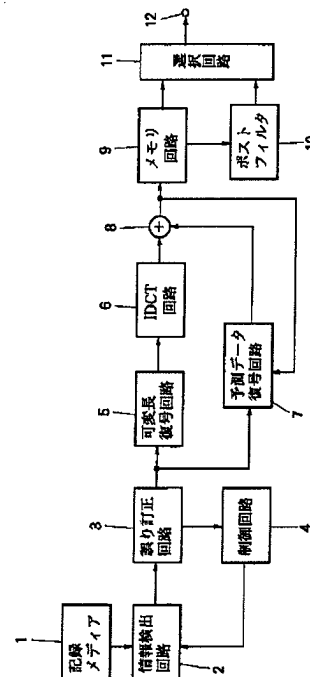
(74) 代理人 弁理士 高田 守 (外4名)

(54) 【発明の名称】 デジタル映像信号再生装置

(57) 【要約】

【目的】 特殊再生時には再生画像に対してポストフィルタをかけて、特殊再生時にブロック歪が目立たないデジタル映像信号再生装置を得る。

【構成】 光ディスク等の記録メディアに記録されている画像データを読みだして再生する映像信号再生装置において、特殊再生時に復号されるデータに対して画面単位でポストフィルタ(10)を施し、通常再生時にはポストフィルタを施さないように制御することにより、特殊再生画像がフリーズされた場合などブロック歪が目だちにくくなる。



## 【特許請求の範囲】

【請求項1】 動き補償予測とDCTとを用いて高能率符号化された画像情報として記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、映像の特殊再生時に前記記録メディア上から前記画像情報の内の一部のフィールドまたはフレームを復号する復号手段と、

前記復号手段で復号されたデジタル映像信号に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とするデジタル映像信号再生装置。

【請求項2】 前記復号手段では、前記記録メディア上から前記画像情報の内の画像内変換された符号化画像（以下、Iピクチャという。）のみを復号することを特徴とする請求項1に記載のデジタル映像信号再生装置。

【請求項3】 動き補償予測とDCTとを用いて高能率符号化された画像情報の一部分が特殊再生用のデータとして、通常再生時のみに使用するデータとは別のエリアに記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、

映像の特殊再生時に前記記録メディア上から前記特殊再生用のデータのみを復号する復号手段と、前記復号手段で復号された特殊再生画像に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とするデジタル映像信号再生装置。

【請求項4】 前記記録メディア上には、前記画像情報の内のIピクチャの一部分が特殊再生用のデータとして記録されていることを特徴とする請求項3に記載のデジタル映像信号再生装置。

【請求項5】 直交変換を用いて高能率符号化された画像情報として記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、

映像の特殊再生時に前記記録メディア上から前記デジタル映像信号の一部分を復号する復号手段と、前記復号手段で復号されたデジタル映像信号に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とするデジタル映像信号再生装置。

【請求項6】 直交変換を用いて高能率符号化された画像情報の一部分が特殊再生用のデータとして、通常再生時のみに使用するデータとは別のエリアに記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、映像の特殊再生時に前記記録メディア上から前記特殊再生用のデータのみを復号する復号手段と、前記復号手段で復号された特殊再生画像に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とするデジタル映像信号再生装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】この発明は、光ディスク、磁気テープ等の記録メディア上に記録されている符号化されたデジタル映像信号の再生を行うデジタル映像信号再生装置に関する。

## 【0002】

【従来の技術】映像信号を符号化する場合の高能率符号化方式の一つとして、動き補償予測を用いた画像間予測符号化と画像内変換符号化とを組み合わせた、ハイブリッド符号化方式がある。図14は例えば、CCITTのISO-IEC/JTC1/SC29/WG11 MPEG92/N0245 Test Model 2に従って構成された従来のデジタル映像信号再生装置の一例を示すブロック回路図である。この従来例において、光ディスク、磁気テープ等の記録メディア1上にも、このハイブリッド符号化方式によって符号化された映像信号が記録されている。

【0003】図14において、記録メディア1に記録されている映像信号は、情報検出回路2によって順次読み出され、誤り訂正回路3に入力される。誤り訂正回路3の出力は制御回路4に入力され、制御回路4により情報検出回路2を制御する。一方、誤り訂正回路3の出力は可変長復号回路5にも入力されIDCT回路6で逆離散コサイン変換が施され、その出力が加算器8への第1の入力として与えられる。また、誤り訂正回路3の出力は予測データ復号回路7にも入力され、予測データ復号回路7の出力は加算器8への第2の入力として与えられる。加算器8での加算結果は、メモリ回路9を介して出力端子12から出力される。

【0004】図15は、デジタル映像信号を符号化するための符号化装置を示すブロック図である。従来のデジタル映像信号再生装置において再生されるデジタル映像信号は、図15に示すようなシステムによって記録メディア1に符号化データとして記録されている。図15において、入力端子80から入力されたデジタル映像信号は、まずメモリ回路81に入力される。メモリ回路81から出力される映像信号92aは、減算器82への第1の入力、および動き補償予測回路90への第2の入力として与えられる。減算器82の出力は、DCT回路83を介して量子化回路84に入力される。量子化回路84の出力は、可変長符号化回路85を介して誤り訂正回路86に入力される。誤り訂正回路86の出力は変調回路91によってデジタル変調が施され、動き補償予測とDCT（離散コサイン変換）とを用いて高能率符号化された画像情報として、記録メディア1に記録される。

【0005】一方、量子化回路84の出力は、逆量子化回路87を介して、IDCT回路88にも入力される。IDCT回路88の出力は、加算器89への第1の入力として与えられる。加算器89の加算結果である画像情

報93aは、動き補償予測回路90への第1の入力として与えられる。動き補償予測回路90の出力である予測画像情報94aは、加算器89への第2の入力、および減算器82への第2の入力として与えられている。

【0006】図16は、デジタル映像信号の符号化装置における動き補償予測回路90の一例を示すブロック回路図である。図において、入力端子92にはメモリ回路81の映像信号92aが、入力端子93には加算器89からの画像情報93aがそれぞれ与えられる。入力端子93から入力される画像情報93aは、切り替え器95を介して、フレームメモリ95aまたはフレームメモリ95bに入力される。フレームメモリ95aから出力される参照画像は、動きベクトル検出回路96aへの第1の入力として与えられる。動きベクトル検出回路96aの第2の入力には、入力端子92から入力される映像信号92aが与えられる。動きベクトル検出回路96aの出力は、予測モード選択器97に入力される。

【0007】一方、フレームメモリ95bから出力される参照画像は、動きベクトル検出回路96bへの第1の入力として与えられる。動きベクトル検出回路96bの第2の入力には、入力端子92から入力される映像信号92aが与えられる。動きベクトル検出回路96bの出力は、予測モード選択器97への第2の入力として与えられている。

【0008】予測モード選択器97の第3の入力には、入力端子92から入力される映像信号92aが与えられる。予測モード選択器97の第1の出力は、切り替え器98への第1の入力として与えられる。切り替え器98の第2の入力には0信号が与えられる。切り替え器98への第3の入力としては、予測モード選択器97の第2の出力が与えられる。切り替え器98の出力は、予測画像情報94aとして出力端子94から出力される。

【0009】次に、図15のデジタル映像信号の符号化装置における符号化動作について説明する。まず、動き補償予測を用いた画像間予測符号化と画像内変換符号化とを組み合わせたハイブリッド符号化方式で記録された映像信号のうち、画像間予測符号化される映像信号部分について、概略を説明する。

【0010】図17は、映像信号符号化方式における動き補償予測を示す概念図である。また、図18は、映像信号符号化方式におけるメモリ回路81の動作を示す概念図である。

【0011】図17において、一連の各画像情報は画像内変換された符号化画像（以下、Iピクチャという。）I、片方向予測符号化画像（以下、Pピクチャという。）P<sub>1</sub>～P<sub>4</sub>、及び両方向予測符号化画像（以下、Bピクチャという。）B<sub>1</sub>～B<sub>10</sub>の3つのタイプの画像情報に分けられる。例えば、N枚に1枚の画像をIピクチャとし、M枚に1枚はPピクチャまたはIピクチャとする場合、n、mを整数、かつ、 $1 \leq m \leq N/M$ とし

て、 $(N \times n + M)$ 番目の画像はIピクチャ、 $(N \times n + M \times m)$ 番目の画像（ $m \neq 1$ ）はPピクチャ、 $(N \times n + M \times m + 1)$ 番目から $(N \times n + M \times m + M - 1)$ 番目の画像はBピクチャとする。このとき、 $(N \times n + 1)$ 番目の画像から $(N \times n + N)$ 番目の画像までをまとめてGOP（Group of Pictures）と呼ぶ。

【0012】ここで、図17には $N=15$ 、 $M=3$ の場合のGOPを示している。図において、Iピクチャは画像間予測を行わず、画像内変換符号化のみを行う。Pピクチャは直前のIピクチャまたはPピクチャから予測を行う。例えば、図中6番目の画像はPピクチャであるが、これは3番目のIピクチャから予測を行う。また、図中9番目のPピクチャは6番目のPピクチャから予測する。Bピクチャは直前と直後のIピクチャまたはPピクチャから予測する。例えば、図中、4番目および5番目のBピクチャは、3番目のIピクチャと6番目のPピクチャの双方から予測することになる。従って、4番目、5番目の画像は、6番目の画像情報の符号化を行った後、符号化する。

【0013】図15は、このようなハイブリッド符号化方式のデジタル映像信号を符号化するための符号化装置であって、入力端子1から入力されたデジタル映像信号は、メモリ回路81に入力される。メモリ回路81では、画像情報を符号化順に並べ替えて出力する。すなわち、先に述べたように、図17において、例えば1番目のBピクチャは3番目のIピクチャの後に符号化されるので、ここで画像情報の並べ替えを行う。

【0014】図18には、このようなメモリ回路81における画像情報の並べ替えの動作を示している。図18(a)のように入力された画像シーケンスは、図18(b)の順で出力される。メモリ回路81から出力される映像信号92aは、時間軸方向の冗長度を落とすために減算器82で動き補償予測回路90から出力される予測画像情報94aとの画像情報間で差分がとられた後、DCT回路83で空間軸方向にDCTが施される。DCT変換された画像情報の係数（DCT係数）は量子化回路84で量子化され、さらに可変長符号化回路85に入力される。可変長符号化回路85では、量子化されたDCT係数、及び動きベクトル情報が可変長符号化され、アドレス情報等のヘッダ情報が付加されて誤り訂正回路86に入力される。

【0015】誤り訂正回路86では、入力される画像情報に対して誤り訂正処理を行い変調回路91に出力する。変調回路91では、画像情報をデジタル変調して、光ディスクなどの記録メディア1に記録する。

【0016】一方、量子化回路84によって量子化された変換係数は、逆量子化回路87で逆量子化され、さらにIDC回路88でIDCTが施された後、加算器89で予測画像情報94aと加算されて、復号画像の画像情報93aが求められる。この画像情報93aは、次の画

像の符号化のために動き補償予測回路90に入力される。

【0017】次に、動き補償予測回路90の動作を、図16の各ブロックに従って説明する。動き補償予測回路90では、フレームメモリ95aとフレームメモリ95bに記憶された2つの参照画像の画像情報を用いて、メモリ回路81から出力される映像信号92aを動き補償予測し、予測画像情報94aを出力する。

【0018】まず、上記のように符号化され復号された画像情報93aがIピクチャまたはPピクチャである場合、次の画像の符号化のために、この画像情報93aは、フレームメモリ95aまたはフレームメモリ95bに記憶される。このとき、フレームメモリ95aとフレームメモリ95bのうち、時間的に先に更新された方を選択するよう、切り替え器95が切り替えられる。復号された画像情報93aがBピクチャである場合は、フレームメモリ95aおよびフレームメモリ95bへの書き込みは行われない。

【0019】このような切り替えにより、例えば、図17の1番目、2番目のBピクチャが符号化されるときには、フレームメモリ95aとフレームメモリ95bに、それぞれ0番目のPピクチャと3番目のIピクチャが記憶されており、その後、6番目のPピクチャが符号化され復号されると、フレームメモリ95aは6番目のPピクチャの復号画像に書き換えられる。

【0020】したがって、次の4番目、5番目のBピクチャが符号化されるときには、上記フレームメモリ95aには、それぞれ、6番目のPピクチャと3番目のIピクチャが記憶されている。さらに、9番目のPピクチャが符号化され復号されると、フレームメモリ95bは9番目のPピクチャの復号画像に書き換えられる。従って、7番目、8番目のBピクチャが符号化されるときには、上記フレームメモリ95bには、それぞれ、6番目のPピクチャと9番目のPピクチャが記憶されている。

【0021】メモリ回路81から出力される映像信号92aが、動き補償予測回路90に入力されると、2つの動きベクトル検出回路96a、96bが、それぞれ、フレームメモリ95a、95bに記憶されている参照画像をもとに、動きベクトルを検出し動き補償予測画像を出力する。すなわち、映像信号92aを複数の画像ブロックに分割し、各画像ブロックについて、参照画像の中で最も予測歪が小さくなるような画像ブロックを選び、その画像ブロックの相対的位置を動きベクトルとして出力するとともに、この画像ブロックを動き補償予測画像として出力端子94から出力している。

【0022】他方、予測モード選択器97は、動きベクトル検出回路96a、96bから出力される2つの動き補償予測画像、およびこれらの平均画像のうち、予測歪が最も小さいものを選択し、予測画像として出力する。このとき、映像信号92aがBピクチャについてのもの

でなければ、時間的に先に入力された参照画像に相当する動き補償予測画像が常に選択されて、出力端子94から出力される。

【0023】また、予測モード選択器97では、予測を行わない画像内符号化と、選択された予測画像による画像間予測符号化のうち、符号化効率がよい画像情報が選択される。このとき、映像信号92aがIピクチャであれば、常に、画像内符号化が選択される。画像内符号化が選択された場合は、画像内符号化モードを示す信号が予測モードとして出力され、画像間予測符号化が選択された場合は、選択された予測画像を示す信号が予測モードとして出力される。切り替え器98は、予測モード選択器97から出力される予測モードが、画像内符号化モードであれば0信号を出力し、そうでなければ、予測モード選択器97から出力される予測画像を出力する。

【0024】以上のことから、メモリ回路81から出力される映像信号92aがIピクチャのときは、動き補償予測回路90は常に0信号を予測画像情報94aとして出力するので、Iピクチャの画像情報については画像間予測を行わず、画像内変換符号化される。また、メモリ回路81から出力される映像信号92aが、例えば、図17の6番目のPピクチャのときは、動き補償予測回路90は、図17の3番目のIピクチャから動き補償予測し、予測画像情報94aを出力する。また、メモリ回路81から出力される映像信号92aが、例えば図17の4番目のBピクチャのときは、動き補償予測回路90は、図17の3番目のIピクチャと6番目のPピクチャから動き補償予測し、予測画像情報94aを出力する。

【0025】次に、図14の様に構成されたデジタル映像信号再生装置の動作について説明する。光ディスク等の記録メディア1上に記録された画像情報は情報検出回路2に読み出されデジタル復調等が行われ、誤り訂正回路3に出力される。誤り訂正回路3では、入力されるデジタル映像信号を誤り訂正処理して、画像情報および動きベクトル情報とアドレス情報とに分離する。そして制御回路4にはアドレス情報が出力される。制御回路4では、入力されたアドレス情報にしたがって情報検出回路2の光ヘッドの位置を確認して、次に読み出すデータが格納されている位置に光ヘッドをジャンプするための制御信号を発生する。

【0026】ここで、通常再生の場合は制御回路4では再生を開始する点に光ヘッドをジャンプさせた後は、光ディスク上に記録されているデータを連続して読み出すように制御する。一方、高速再生の場合は例えばIピクチャのみを読み出して再生する方法がある。この場合、制御回路4では情報検出回路2の光ヘッドを制御して、Iピクチャの先頭にアドレスジャンプして、Iピクチャの画像情報の読み出しが終了したら次のIピクチャの先頭にジャンプする動作が繰り返される。

【0027】しかし、Iピクチャの情報量が多い場合や

Iピクチャの先頭アドレスをサーチするために多くの時間を費やした場合、光ディスク等の記録メディアから1フレームの時間内ですべてのIピクチャを読み出すことができない。このような場合、現在出力している画面をフリーズして、次のIピクチャの画像情報の読み出しが完了した時点で再生出力を更新する。

【0028】一方、誤り訂正回路3によって分離された画像情報は、可変長復号回路5によって可変長データから固定長データに変換され、さらに逆量子化され、IDCT回路6によってIDCTが施され、加算器8への第1の入力として供給される。これに対して予測データ復号回路7では、誤り訂正回路3から出力される動きベクトル情報に従って予測画像を復号し、これが加算器8への第2の入力として与えられる。

【0029】この場合、予測データ復号回路7は、動き補償予測回路90と同様に加算器8によって復号されるIピクチャおよびPピクチャの画像情報を記憶するフレームメモリを備えており、PピクチャおよびBピクチャの入力時には、動きベクトル情報に従って対象となるIピクチャおよびPピクチャから予測画像を再現し、加算器8に出力している。なお、IピクチャおよびPピクチャの入力時での参照画像情報の更新方法については、図15の符号化装置の場合と同じであるので説明を省略する。

【0030】加算器8では予測データ復号回路7の出力とIDCT回路6の出力を加算し、この加算結果はメモリ回路9に出力される。既に説明した通り、符号化時には図18に示す様な符号化する順に従って、時間的に連続して入力する映像信号をフレーム単位で並び替えている。このためメモリ回路9では、図18(b)に示す順で入力されるフレーム単位の画像情報を図18(a)の順に並び替えて、時間的に連続する画像情報として出力端子12から出力する。ただし、高速再生時にIピクチャのみを再生する場合は、メモリ回路9ではピクチャ単位でのデータの並び替えは行わない。

#### 【0031】

【発明が解決しようとする課題】従来のデジタル映像信号再生装置は以上のように構成され、Iピクチャを使って高速再生を行う場合、GOPの先頭部分を光ディスク等の記録メディア上に記録してあるビットストリーム上から検出した後、Iピクチャのデータを読み出すことになる。このため、Iピクチャのデータ量が非常に大きくなった場合や、GOPの先頭部分をサーチするために多くの時間を要した場合、光ディスク等の記録メディアから画像情報をすべて読み出すまで再生出力がフリーズされる。しかし、低レートで符号化された再生画像をフリーズした場合には、1画面を構成する複数の画像ブロック間の歪が目立つという問題があった。

【0032】この発明は上記のような問題点を解消することを目的としてなされたもので、特殊再生時には再生

画像に対してポストフィルタをかけて、特殊再生時にブロック歪が目立たないデジタル映像信号再生装置を得ることを目的とする。

#### 【0033】

【課題を解決するための手段】請求項1の発明に係るデジタル映像信号再生装置は、動き補償予測とDCTとを用いて高能率符号化された画像情報として記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、映像の特殊再生時に前記録メディア上から前記画像情報の内の一部のフィールドまたはフレームを復号する復号手段と、前記復号手段で読み出されたデジタル映像信号に対して画面単位でポストフィルタを施すフィルタ手段とを備えることを特徴とする。

【0034】請求項2の発明に係るデジタル映像信号再生装置は、前記復号手段では、前記録メディア上から前記画像情報の内の画像内変換された符号化画像（以下、Iピクチャという。）のみを復号することを特徴とする。

【0035】請求項3の発明に係るデジタル映像信号再生装置は、動き補償予測とDCTとを用いて高能率符号化された画像情報の一部分が特殊再生用のデータとして、通常再生時のみに使用するデータとは別のエリアに記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、映像の特殊再生時に前記録メディア上から前記特殊再生用のデータのみを復号する復号手段と、前記復号手段から読み出された特殊再生画像に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とする。

【0036】請求項4の発明に係るデジタル映像信号再生装置は、前記録メディア上には前記画像情報の内のIピクチャの一部分が特殊再生用のデータとして記録されていることを特徴とする。

【0037】請求項5の発明に係るデジタル映像信号再生装置は、直交変換を用いて高能率符号化された画像情報として記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、映像の特殊再生時に前記録メディア上から前記デジタル映像信号の一部分を復号する復号手段と、前記復号手段で復号されたデジタル映像信号に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とする。

【0038】請求項6の発明に係るデジタル映像信号再生装置は、直交変換を用いて高能率符号化された画像情報の一部分が特殊再生用のデータとして、通常再生時のみに使用するデータとは別のエリアに記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置において、映像の特殊再生時に前記録メディア上から前記特殊再生用

のデータのみを復号する復号手段と、前記復号手段で復号された特殊再生画像に対して画面単位でポストフィルタを施すフィルタ手段とを備えたことを特徴とする。

【0039】

【作用】請求項1の発明に係るデジタル映像信号再生装置では、動き補償予測とDCTを用いて高能率符号化された画像情報が記録された記録メディアから、特殊再生時に一部のフィールドまたはフレームの画像情報を読み出して復号した後に、画面単位でポストフィルタを施して、再生画像として出力するため、特殊再生画像がフリーズされた場合などブロック歪が目だちににくい。

【0040】請求項2の発明に係るデジタル映像信号再生装置では、動き補償予測とDCTを用いて高能率符号化された画像情報が記録された記録メディアから、特殊再生時にIピクチャの画像情報のみを読み出し復号した後に、画面単位でポストフィルタを施したため、特殊再生画像がフリーズされた場合などにブロック歪が目だちににくい。

【0041】請求項3の発明に係るデジタル映像信号再生装置では、動き補償予測とDCTを用いて高能率符号化された特殊再生用のデータが記録された記録メディア上から、特殊再生時に特殊再生用のデータのみを通常再生用のデータとは別のエリアから読み出して復号した後に、画面単位でポストフィルタを施し再生画像として出力するため、特殊再生画像のブロック歪が目だちににくい。

【0042】請求項4の発明に係るデジタル映像信号再生装置では、記録メディア上には画像情報の内のIピクチャの一部分が特殊再生用のデータとして記録されているから、特殊再生時には画像情報のうちのIピクチャの一部分を特殊再生用のデータとして通常再生用のデータとは別のエリアから読み出して復号した後に、画面単位でポストフィルタを施し再生画像として出力できる。

【0043】請求項5の発明に係るデジタル映像信号再生装置では、直交変換を用いて高能率符号化された画像情報が記録された記録メディアから、特殊再生時に画像情報の一部分を読み出して復号した後に、画面単位でポストフィルタを施して、再生画像として出力するため、特殊再生画像がフリーズされた場合などブロック歪等が目だちににくい。

【0044】請求項6の発明に係るデジタル映像信号再生装置によれば、直交変換を用いて高能率符号化された特殊再生用のデータが記録された記録メディア上から、特殊再生時に特殊再生用のデータのみを通常再生用のデータとは別のエリアから読み出して復号した後に、画面単位でポストフィルタを施し再生画像として出力するため、特殊再生画像のブロック歪が目だちににくい。

【0045】

【実施例】

実施例1. 以下、添付した図面を参照して、本発明の実施例1について説明する。図1は、本発明の実施例1のデジタル映像信号再生装置の構成を示すブロック図である。図1において、図14の従来装置と同一または相当部分については同一符号を付けている。記録メディア1上に記録してある画像情報は情報検出回路2によって読み出され、デジタル復調して誤り訂正回路3に出力する。誤り訂正回路3では、情報検出回路2の出力につき誤り訂正処理を行い、アドレス情報を制御回路4に出力する。制御回路4では入力されるアドレス情報に従って情報検出回路2を制御する。一方、誤り訂正回路3の出力は可変長復号回路5にも入力され、IDCT回路6を介して加算器8への第1の入力として与えられる。また、誤り訂正回路3から出力される動きベクトル情報は予測データ復号回路7に入力され、予測データ復号回路7の出力は加算器8への第2の入力として与えられる。加算器8の出力は、メモリ回路9を介してポストフィルタ10および選択回路11に入力される。選択回路11では、メモリ回路9の出力とポストフィルタ10の出力のいずれかを選択して、出力端子12から出力する。

【0046】次に、実施例1のデジタル映像信号再生装置の動作について説明する。図2は、実施例1における記録メディア1上でのデータ配列を説明するための概念図である。この記録メディア1は例えば光ディスク等の記録媒体である。ここで、記録メディア1にはデジタル映像信号を動き補償予測して、その予測誤差をDCTにより周波数変換を行って量子化し、可変長符号化処理を行うことによって高能率符号化された画像情報に対して、誤り訂正符号およびGOP単位でのアドレス情報を付加された映像信号が記録されている。ただし、高能率符号化方法については従来例で説明したハイブリッド符号化方式(図15)と同じである。そこで、その詳細な説明は省略するが、記録メディア1上には図2に示すようにGOP単位で画像情報が記録される。図2のGOPの先頭部分にあるヘッダ情報には、GOP単位でのアドレス情報等が記録され、以下Iピクチャの画像情報を先頭に、図18(b)に示すように並べ替えられた順番で画像情報が記録されている。

【0047】光ディスク等の記録メディア1上に記録された画像情報は情報検出回路2によって読み出されてデジタル復調等が行われ、誤り訂正回路3に出力される。誤り訂正回路3では、復調されたデジタルデータを誤り訂正処理して、GOP単位でのアドレス情報、画像情報および動きベクトル情報に分離する。制御回路4では、入力されるGOP単位でのアドレス情報にしたがって情報検出回路2の光ヘッドの位置を確認して、情報検出回路2に対して、次に読み出す画像情報が格納されている位置に光ヘッドをジャンプするための制御信号を発生する。

【0048】この制御回路4では、通常再生の場合は再

生を開始する点に光ヘッドをジャンプさせた後は、光ディスク上に記録されている画像情報を連続して読み出すように制御する。これに対して高速再生の場合には、図2に示すようにGOPの先頭に記録してあるIピクチャの画像情報のみを光ディスクから読み出して再生を行う。そこで、上記制御回路4においては情報検出回路2の光ヘッドを制御して、まずGOPの先頭にアドレスジャンプして、Iピクチャについての画像情報を読み出し、それが終了したら次のGOPの先頭にジャンプするような動作が繰り返される。

【0049】ここで、図17に示すようにGOPが15フレームの画像情報を単位として構成されている場合には、1フレームの時間内にIピクチャについての画像情報のすべてを読み出すことができれば、1.5倍速の高速再生が実現できる。しかし、映像信号の符号量はGOP単位で制御されるためにIピクチャの情報量は一定ではなく、GOP毎に変化する。さらに、光ディスク等からそこに記録された映像信号を読み出す場合、光ヘッドが光ディスク上の目的の点まで移動するための回転待ち時間が生じる。したがって、Iピクチャの情報量が多い場合やIピクチャの先頭アドレスをサーチするために多くの時間を費やした場合には、光ディスクから1フレームの時間内ですべてのIピクチャについての映像信号を読み出すことができなくなる。

【0050】この様な場合には、現在実行中の記録メディア1からのIピクチャの画像情報の読み出しが完了するまで、現在出力している画面をフリーズする。ただし、画面のフリーズおよび更新はフレーム信号に同期して行う。すなわち、次のGOPの先頭へのアドレスジャンプはフレーム信号に同期して行い、光ディスクからすべてのIピクチャを読み出した後のフレームパルスにしたがってアドレスジャンプを行う。

【0051】また、誤り訂正回路3によって分離された動きベクトル情報は予測データ復号回路7に入力され、画像情報については可変長復号回路5に入力される。ここで、可変長復号回路5、IDCT回路6、予測データ復号回路7および加算器8の動作については従来例のデジタル映像信号再生装置と同じであるため、それらの説明は省略する。

【0052】メモリ回路9では、ブロック単位で入力される画像の映像信号をフレーム信号に同期してライン単位で出力する。ただし、図18に示す様に符号化時には時間的に連続する映像信号を符号化する順にしたがってフレーム単位での並び替えを行っている。このため、メモリ回路9では加算器8の出力として図18(b)に示す順で入力される画像情報を、図18(a)の順に、すなわち画像情報が時間的に連続する様に並び替えて出力端子12から出力する。ただし、高速再生時にはIピクチャのみを再生するため、メモリ回路9でピクチャ単位での画像情報の並び替えを行わない。

【0053】したがって、高速再生時には加算器8から出力されるIピクチャの画像情報をフレーム単位でメモリ回路9内のフレームメモリに記録して、フレーム信号に同期する画像情報として出力する。すなわち、画像情報を記録するフレームメモリと読み出すフレームメモリの切り替えは、フレーム信号に同期して行う。ただし、光ディスクからのIピクチャの読み出しが1フレームの時間内に終了しない場合は、メモリ回路9内部のフレームメモリの切り替えを停止する。こうして、すべてのIピクチャの画像情報がメモリ回路9に記録されるまでは、現在出力されている画面をフリーズできることになる。また、選択回路11は、通常再生時にはメモリ回路9からフレーム信号に同期して出力される画像情報を選択して出力端子12に出力する。一方、高速再生時には、メモリ回路9の出力がポストフィルタ回路10によってフィルタ処理された画像情報を選択して、出力端子12から出力する。

【0054】ここで、デジタル映像信号を5Mbps以下のレートで符号化した場合、その再生画像にブロック歪が発生する。このブロック歪は、通常再生された映像からは視覚上確認することはできないが、画面をフリーズした場合にはブロック歪がはっきり確認できる。したがって、高速再生時にIピクチャをフリーズして再生した場合、再生画像のブロック歪がはっきりとわかる。このため、高速再生時にはポストフィルタ回路10によって1画面単位で低域通過フィルタを施すことにより、再生画像のブロック歪を軽減している。この場合、低域通過フィルタにより再生画像の解像度は低下するが、高速再生時の再生画像としては解像度が低下した画像より、不自然なブロック歪が目立つ再生画像の方が主観的には見苦しいことが多い。すなわち、高速再生時の再生画像に対して画面単位でポストフィルタを施すことにより、ブロック歪が目立たない高速再生を実現することができる。

【0055】図3は、このポストフィルタ回路10の一例を示すブロック図である。ここに示すように、実際には、ポストフィルタ回路10はライン単位で入力される画像情報に対して水平LPF31によって水平方向のLPFを施した後に、垂直LPF32によって垂直方向に対してLPFを施している。図4は、実施例1におけるポストフィルタ回路10の周波数特性を示す図である。このポストフィルタ回路10は、図5、図6に示すように、乗算係数が

$$A0 = 0.603513641$$

$$A1 = 0.25530132$$

$$A2 = -0.05175682$$

$$A3 = -0.00530132$$

の乗算器によって構成され、図4に示す周波数特性を持つ7タップのFIRフィルタが用いられる。

【0056】7タップのLPFとして水平LPF31を

構成すれば、図5に示すようになる。すなわち図5において、従属接続された6段のフリップフロップ(FF)41~46によって、入力された画像情報は遅延される。そして、乗算係数が同じになる画像情報がそれぞれ加算器47~49によって加算され、これら加算器47~49の出力およびFF43の出力を乗算器50~53で所定の乗算係数と乗算して、その結果を加算器54で加算することにより、7タップの水平フィルタを構成している。また、垂直LPF32は図6に示すように構成できる。すなわち、6個のラインメモリ61~66によって垂直方向に対して画像情報の遅延を行っている。さらに、乗算係数が同じになる画像情報がそれぞれ加算器67~69によって加算され、これら加算器67~69の出力およびラインメモリ63の出力を乗算器70~73で所定の乗算係数と乗算して、その結果を加算器74で加算することにより、7タップの垂直フィルタを構成している。

【0057】なお、上記実施例では高速再生時にGOPの先頭に記録してあるIピクチャの画像情報にアドレスジャンプして、Iピクチャの読み出しが終了した後に次のGOPのIピクチャにジャンプしているが、次のGOPへのアドレスジャンプを一定時間単位で行ってもよい。すなわち、予め決められた一定時間内でIピクチャの画像情報を光ディスク等の記録メディア1から読み出し、一定時間内にIピクチャの読み出しが完了してなくても次のGOPの先頭にアドレスジャンプを行う。このため、高速再生画像は、図7に示すように記録メディア1から読み出すことができたエリアの画像情報のみが更新されて再生される。この場合、ポストフィルタ回路10により画面内で更新された部分と更新されていないエリアの境界を目立たなくすることができる。

【0058】また、上記実施例では記録メディア1を光ディスクとしていたが、必ずしも光ディスクである必要はない。磁気テープ等の記録メディアについても、同様の効果を得ることができる。また、上記実施例ではポストフィルタ10として7タップのLPFを使用しているが、必ずしも7タップである必要はなく、任意のタップ数でLPFを構成することができる。

【0059】さらに上記実施例では、高速再生時のみポストフィルタ回路10の画像情報を選択するようにしたが、スロー再生およびスチル再生時など、他の特殊再生時にもポストフィルタ回路10を用いてブロック歪を軽減することができる。高速再生時でも再生画面がフリーズされずに出力される場合には、再生画像のブロック歪は目立たなくなる。したがって、そのような場合にはポストフィルタを施さないように、選択回路11を制御してもよい。

【0060】また、上記実施例では、特殊再生は各GOPのIピクチャのみをディスクから読み出して再生するものとして説明したが、Pピクチャ等任意のピクチャを

再生することによって高速再生を行う場合でも、同様にポストフィルタ回路10を用いてブロック歪を軽減することができる。さらに、必ずしも各GOPからそのIピクチャをすべて再生する必要はなく、GOP数単位に1回だけIピクチャを再生してもよい。

【0061】**実施例2**、つぎに、本発明の実施例2について説明する。実施例2のデジタル映像信号再生装置では、動き補償予測とDCTとを用いて高能率符号化された画像情報の一部分が、通常再生時のみに使用するデータとは別に、特殊再生用のデータとして分離されたデジタル映像信号を、記録メディア上から読み出し再生するようにしている。

【0062】図8は、本発明の実施例2におけるデジタル映像信号再生装置の構成を示すブロック図である。この図において、図1の装置と同一または相当部分については同一符号を付けている。13は誤り訂正回路であり、ここでは情報検出回路2の出力をデジタル復調し、誤り訂正処理を行い、光ディスク等の記録メディア1からアドレス情報、動きベクトル情報、特殊再生用データ、通常再生用データに分離された画像情報として出力する。また、14はブロックデータ再構成回路であり、ここでは通常再生時に、特殊再生用のデータと通常再生時のみに使用するデータとを合わせてブロックデータを再構成する。

【0063】このように構成されたデジタル映像信号再生装置の動作を説明する。図9は、実施例2における記録メディア1上でのデータ配列を説明するための概念図、図10は、DCT係数の分割を説明するための概念図である。なお、記録メディア1は例えば光ディスク等の記録媒体である。ここで、記録メディア1にはデジタル映像信号を動き補償予測して、その予測誤差をDCTにより周波数変換を行って量子化し、さらに可変長符号化処理を行うことによって高能率符号化された画像情報に対して、誤り訂正符号およびGOP単位でのアドレス情報を付加された映像信号が記録される。また、画像情報のうちIピクチャのDCT係数は、図10に示す様にその低域部分と高域部分が互いに分離され、低域成分を特殊再生用のデータとして、通常再生用のデータとは別のエリアに記録されている。この場合、通常再生用のデータはIピクチャの低域成分と、PピクチャおよびBピクチャの画像情報から構成される。したがって通常再生時にIピクチャを再生するためには、それぞれ異なるエリアに記録してあるその低域成分と高域成分とを再構成して、Iピクチャの画像情報を復号する必要がある。

【0064】ここでIピクチャの低域成分とは、8画素×8ラインを単位ブロックサイズとしてDCTを行う場合に、画像情報の重要な成分を含んでいる、例えば図10の破線で囲む領域として示されるような、水平および垂直方向の低域成分を意味する。この場合、図10に示す低域成分のみを使用して復号を行っても画像の内容を

十分把握することができる。このため、高速再生時には図10の破線で囲まれた低域成分の6個の信号のみを用いて、画像再生を行うことができる。こうすれば、Iピクチャの低域成分の情報量は、Iピクチャ全体の画像情報の情報量に比べて少ないため、高速再生時に1フレームの時間内ですべてのIピクチャを読み出すことができる。

【0065】光ディスク等の記録メディア1上に記録された画像情報は情報検出回路2によって読み出されてデジタル復調等が行われ、誤り訂正回路13に出力される。誤り訂正回路13では、復調されたデジタルデータを誤り訂正処理して、通常再生用の画像情報、高速再生用の画像情報、動きベクトル情報およびGOP単位でのアドレス情報に分離する。制御回路4では、入力されるGOP単位でのアドレス情報にしたがって情報検出回路2の光ヘッドの位置を確認して、情報検出回路2に対して、次に読み出す画像情報が格納されている位置に光ヘッドをジャンプするための制御信号を発生する。

【0066】この制御回路4では、通常再生の場合は再生を開始する点に光ヘッドをジャンプさせた後は、光ディスク上に記録されている画像情報を連続して読み出すように制御する。これに対して高速再生の場合には、図9に示すようにGOPの先頭に記録してある高速再生用のデータ（Iピクチャの低域成分）のみを光ディスクから読み出して再生する。そこで、上記制御回路4においては情報検出回路2の光ヘッドを制御して、Iピクチャの先頭にアドレスジャンプして、高速再生用のデータを読み出し、それが終了したら次のGOPの先頭にジャンプするような動作が繰り返される。

【0067】また、誤り訂正回路13によって分離された動きベクトル情報は予測データ復号回路7に入力され、通常再生用データおよび高速再生用データについてはブロックデータ再構成回路14に入力される。ここで、Iピクチャの各ブロックについては、図10に示すように1ブロックの係数が低域成分と高域成分に分割されているため、通常再生時には各ブロック単位で低域成分と高域成分を合成して画像情報を再構成する必要がある。

【0068】すなわち、ブロックデータ再構成回路14では、通常再生時には低域成分である高速再生用データと高域成分である通常再生用データを合成して1ブロック分の画像情報を再構成する。一方、高速再生時にはブロックデータ再構成回路14では、低域成分である高速再生用データのみを用いて1ブロック分の画像情報を合成する。ブロックデータ再構成回路14の出力は可変長復号回路5に入力され、順次、画像情報として復号される。ここで、可変長復号回路5、IDCT回路6、予測データ復号回路7、加算器8およびメモリ回路9の動作については実施例1と同じであるため、それらの説明は省略する。

【0069】また、選択回路11は、通常再生時にはメモリ回路9からフレーム信号に同期して出力される画像情報を選択して出力端子12に出力する。一方、高速再生時には、メモリ回路9の出力がポストフィルタ回路10によってフィルタ処理された画像情報を選択して、出力端子12から出力する。

【0070】ここで、高速再生用データとして各ブロックの低域成分のみを符号化した画像情報には、各ブロックの高域成分が欠落していることによって、その再生画像にブロック歪が発生する場合がある。したがって、高速再生時に再生画像のブロック歪がはっきりとわかる。このため、高速再生時にはポストフィルタ回路10によって1画面単位で低域通過フィルタを施すことにより、再生画像のブロック歪を軽減している。

【0071】この場合、低域通過フィルタにより再生画像の解像度は低下するが、高速再生時の再生画像としては解像度が低下した画像より、不自然なブロック歪が目だつ再生画像の方が主観的には見苦しいことが多い。すなわち、高速再生時の再生画像に対して画面単位でポストフィルタを施すことにより、ブロック歪が目立たない高速再生を実現できる。ここで、ポストフィルタ回路10の動作については実施例1と同じであるため説明を省略する。

【0072】なお上記実施例2では、Iピクチャのブロックデータを低域成分と高域成分に分割して、それぞれ光ディスク上の別エリアに記録するようにしたが、Iピクチャのブロックデータの他に、Pピクチャのブロックデータについても低域成分と高域成分に分割して、その前者を高速再生データとして通常再生用のデータとは別エリアに記録してもよい。

【0073】また、上記実施例2ではIピクチャのブロックデータを低域成分と高域成分に分割して各々をディスク上の別エリアに記録していたが、通常再生用のデータとしては、低域成分と高域成分とに分割しないで記録し、特殊再生用のデータとして別エリアにIピクチャの低域成分のみを記録するようにしてもよい。こうすれば、特殊再生用のデータは高速再生時のみに使用し、通常再生時にはIピクチャの低域成分と高域成分とを再構成する必要はない。

【0074】実施例3。つぎに、本発明の実施例3について、図11乃至図13を参照しながら説明する。実施例3では、動き補償予測を用いずにDCTのみによって高能率符号化された画像情報として記録されたデジタル映像信号を記録メディア上から読み出して、映像を再生するデジタル映像信号再生装置について説明する。

【0075】図11は、この発明の実施例3におけるデジタル映像信号再生装置の構成を示すブロック図である。この図において、図1の実施例1と同一または相当部分については同一符号を付けている。なお、15は誤り訂正回路、16はフレームメモリである。

【0076】次に、この再生装置の動作について説明する。記録メディア1は例えば光ディスク等の記録媒体である。ここで、記録メディア1には、画像情報が例えば8画素×8ラインのブロックにブロッキングしてDCTにより周波数変換されて量子化され、可変長符号化処理によって高能率符号化して、誤り訂正符号およびフレーム単位でのアドレス情報が付加された映像信号として記録されている。この場合、記録メディア1上では図12に示すように各フレームの先頭にはアドレス情報などのヘッダ情報が記録されている。ただし、周波数変換、DCTおよび可変長符号化等の処理については従来例のものと同一であるため、それらの説明は省略する。

【0077】光ディスク等の記録メディア1上に記録された画像情報は情報検出回路2によって読み出されデジタル復調等が行われ、誤り訂正回路15に出力される。誤り訂正回路15では、復調されたデータを誤り訂正処理して、画像情報、フレーム単位でのアドレス情報に分離する。制御回路4では、入力されるフレーム単位でのアドレス情報にしたがって情報検出回路2の光ヘッドの位置を確認して、情報検出回路2に対して、次に読み出すデータが格納されている位置に光ヘッドをジャンプするための制御信号を発生する。

【0078】この制御回路4では、通常再生の場合は再生を開始する点に光ヘッドをジャンプさせた後は、光ディスク上に記録されている画像情報を連続して読み出すように制御する。これに対して、高速再生の場合には、例えば15フレーム毎に1フレーム分の画像情報を光ディスクから読み出して再生を行う。そこで、制御回路4においては情報検出回路2の光ヘッドを制御して、まずフレームの先頭にアドレスジャンプして、1フレーム分のデータを読み出し、それが終了したら15フレーム先のフレームの先頭にジャンプするような動作が繰り返される。

【0079】しかし、光ディスク等からそこに記録された映像信号を読み出す場合、光ヘッドが目的の点に移動するまでの光ディスクの回転待ち時間が生じる。したがって、フレームの先頭アドレスをサーチするために多くの時間を費やした場合には、光ディスクから1フレームの時間内ですべての1フレーム分のデータを読み出すことができない。

【0080】このような場合には、現在出力している画面をフリーズして、次に出力するデータの読み出しが完了した時点で再生出力を更新する。ただし、画面のフリーズおよび更新はフレーム信号に同期して行われる。すなわち、光ディスク上でのアドレスジャンプはフレーム信号に同期して行い、光ディスクからすべてのデータを読み出した後のフレームパルスにしたがってアドレスジャンプを行う。

【0081】また、誤り訂正回路15によって光ディスク上のアドレス情報と分離された画像情報については可

変長復号回路5に入力される。ここで、可変長復号回路5、IDCT回路6の動作については従来例のデジタル映像再生装置と同じであるため、それらの説明は省略する。

【0082】ここで、フレームメモリ16は2フレーム分のフレームメモリによって構成されており、8画素×8ラインのブロック単位で入力される映像信号を1フレーム分記録し、ライン単位で出力する。この場合、画像情報を記録するフレームメモリと読み出すフレームメモリ16の切り替えは、フレーム信号に同期して行う。ただし、光ディスクからの1画面分の画像情報の読み出しが1フレームの時間内に終了しない場合は、フレームメモリ16の切り替えを停止する。したがって、1画面分のデータが記録されるまでは、現在出力されている画面がフリーズされることになる。

【0083】また、選択回路11は、通常再生時にはメモリ回路9からフレーム信号に同期して出力される画像情報を選択して出力端子12に出力する。一方、高速再生時には、メモリ回路9の出力がポストフィルタ回路10によってフィルタ処理された画像情報を選択して、出力端子12から出力する。

【0084】ここで、デジタル映像信号を5Mbps以下のレートで符号化した場合、その再生画像にブロック歪が発生する。このブロック歪は通常再生の場合は視覚上確認することはできないが、画面をフリーズした場合にはブロック歪がはっきり確認できる。したがって、高速再生時に再生出力がフリーズされた場合、再生画像のブロック歪がはっきりとわかる。

【0085】このため、高速再生時にはポストフィルタ回路10によって1画面単位で低域通過フィルタを施すことにより再生画像のブロック歪を軽減している。この場合、低域通過フィルタにより再生画像の解像度は低下するが、高速再生時の再生画像としては解像度が低下した画像より、不自然なブロック歪が目立つ再生画像よりも主観的には見苦しくない。すなわち、高速再生時の再生画像に対して画面単位でポストフィルタを施すことにより、ブロック歪が目立たない高速再生を実現できる。ここで、ポストフィルタ回路10の動作については実施例1と同じであるため、その説明は省略する。

【0086】また、上記実施例3では高速再生時に記録メディア1より1フレーム単位で画像情報を読み出していたが、必ずしも1フレーム単位である必要はなく、例えば図13に示すように1画面をエリア1～5の5つのエリアに分割して、1つのフレームから1エリアずつ読み出して復号するようにしてもよい。この場合、1番目のフレームからエリア1の領域の画像情報を読み出し、2番目のフレームからエリア2の領域の画像情報を読み出し、以下同様に3、4、5番目のフレームからそれぞれエリア3、4、5の領域の各画像情報を読み出し、1画面分のデータを合成する。ただし、出力される5つの

フレームは必ずしも連続フレームである必要はなく、数フレーム間隔であってもよい。

【0087】なお、上記実施例3では高速再生用のデータを通常再生用のデータと分離して光ディスク上に記録していないが、実施例2に示すようにDCT係数の低域成分を高速再生用のデータとしてディスク上で通常再生用のデータと別エリアに記録するシステムにおいても、同様の効果を奏する。

【0088】また、上記実施例3では、記録メディア1が光ディスクであるとして説明しているが、必ずしも光ディスクである必要はなく、磁気テープなどの記録媒体を用いてもよい。

【0089】

【発明の効果】請求項1の発明に係るデジタル映像信号再生装置によれば、特殊再生時に一部のフィールドまたはフレームの画像情報のみを読み出して復号した後に、画面単位でポストフィルタを施して再生画像を出力しているため、特に特殊再生時に画面がフリーズされた場合などブロック歪が目だちににくい。

【0090】請求項2の発明に係るデジタル映像信号再生装置によれば、特殊再生時にIピクチャの画像情報のみを読み出して復号した後に、画面単位でポストフィルタを施して再生画像として出力するため、特に特殊再生時に画面がフリーズされた場合などブロック歪が目だちににくい。

【0091】請求項3の発明に係るデジタル映像信号再生装置によれば、特殊再生時に特殊再生用のデータのみを通常再生用のデータとは別のエリアから読み出して復号した後に、画面単位でポストフィルタを施して再生画像として出力するため、特殊再生画像のブロック歪が目だちににくい。

【0092】請求項4の発明に係るデジタル映像信号再生装置によれば、特殊再生時には画像情報のうちのIピクチャの一部を特殊再生用のデータとして通常再生用のデータとは別のエリアから読み出して復号した後に、画面単位でポストフィルタを施して再生画像として出力するため、特殊再生画像のブロック歪が目だちににくい。

【0093】請求項5の発明に係るデジタル映像信号再生装置によれば、特殊再生時に画像情報の一部分を読み出して復号した後に、画面単位でポストフィルタを施して、再生画像として出力するため、特に特殊再生時に画面がフリーズされた場合などブロック歪が目だちににくい。

【0094】請求項6の発明に係るデジタル映像信号再生装置によれば、特殊再生時に特殊再生用のデータのみを通常再生用のデータとは別のエリアから読み出

して復号した後に、画面単位でポストフィルタを施して再生画像として出力するため、特殊再生画像のブロック歪が目だちににくい。

【図面の簡単な説明】

【図1】 本発明の実施例1のデジタル映像信号再生装置を示すブロック図である。

【図2】 実施例1における記録メディア上でのデータ配列を説明するための概念図である。

【図3】 実施例1におけるポストフィルタ回路の構成を示すブロック図である。

【図4】 実施例1におけるポストフィルタ回路の周波数特性を示す図である。

【図5】 実施例1における水平ポストフィルタの構成を示すブロック図である。

【図6】 実施例1における垂直ポストフィルタの構成を示すブロック図である。

【図7】 実施例1の変形例における特殊再生方法を説明するための概念図である。

【図8】 本発明の実施例2のデジタル映像信号再生装置を示すブロック図である。

【図9】 実施例2における記録メディア上でのデータ配列を説明するための概念図である。

【図10】 実施例2におけるDCT係数の分割を説明するための概念図である。

【図11】 本発明の実施例3のデジタル映像信号再生装置を示すブロック図である。

【図12】 実施例3における記録メディア上でのデータ配列を説明するための概念図である。

【図13】 実施例3の変形例における特殊再生方法を説明するための概念図である。

【図14】 従来のデジタル映像信号再生装置を示すブロック図である。

【図15】 デジタル映像信号を符号化するための符号化装置を示すブロック図である。

【図16】 デジタル映像信号の符号化装置における動き補償予測回路を示すブロック図である。

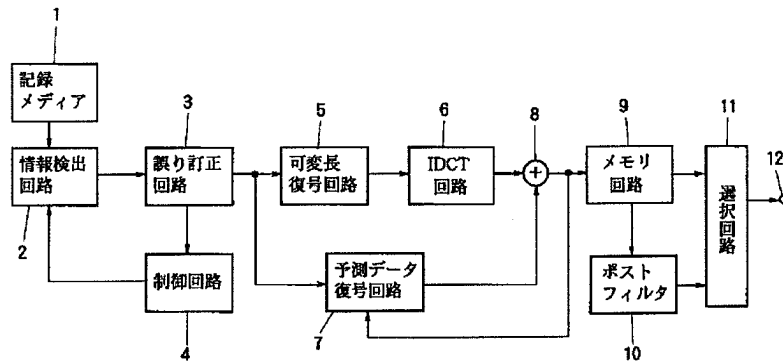
【図17】 映像信号符号化方式における動き補償予測を説明するための概念図である。

【図18】 映像信号符号化方式におけるメモリ回路の動作を説明するための概念図である。

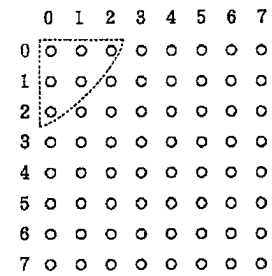
【符号の説明】

1 記録メディア、2 情報検出回路、3 誤り訂正回路、4 制御回路、5 可変長復号回路、6 IDCT回路、7 予測データ復号回路、8 加算器、9 メモリ回路、10 ポストフィルタ回路、11 選択回路、12 出力端子。

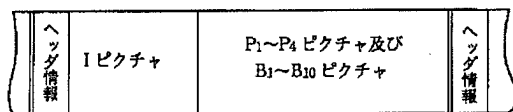
【図1】



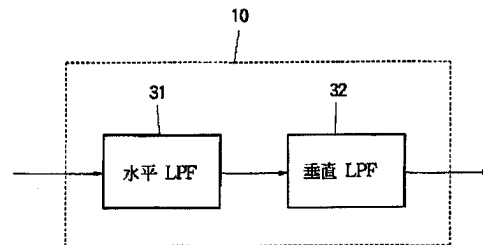
【図10】



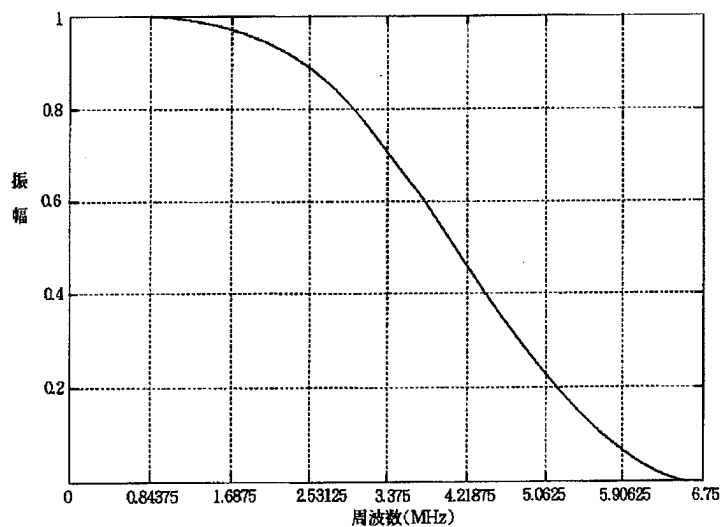
【図2】



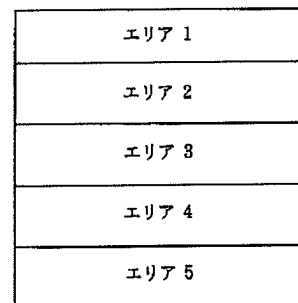
【図3】



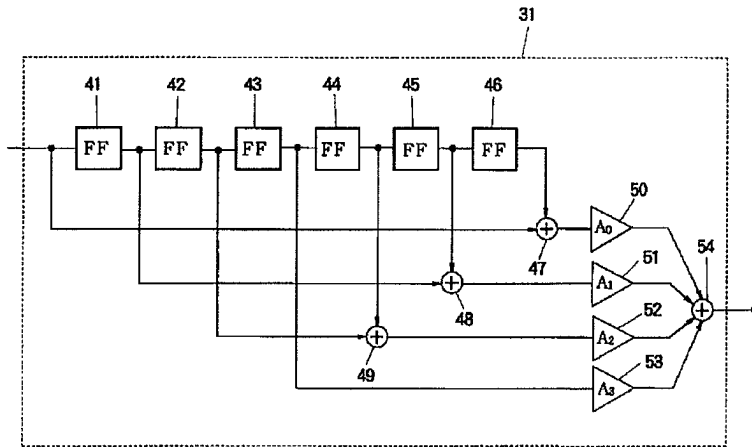
【図4】



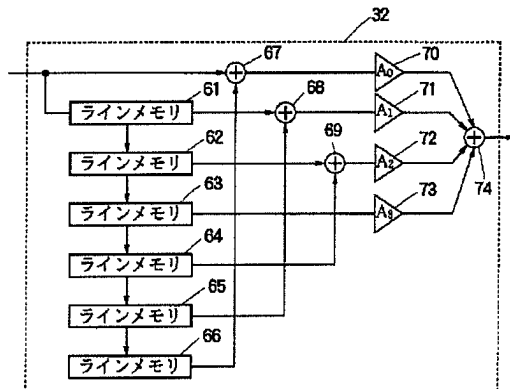
【図13】



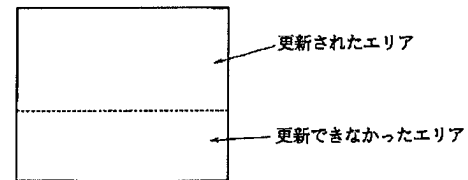
【図5】



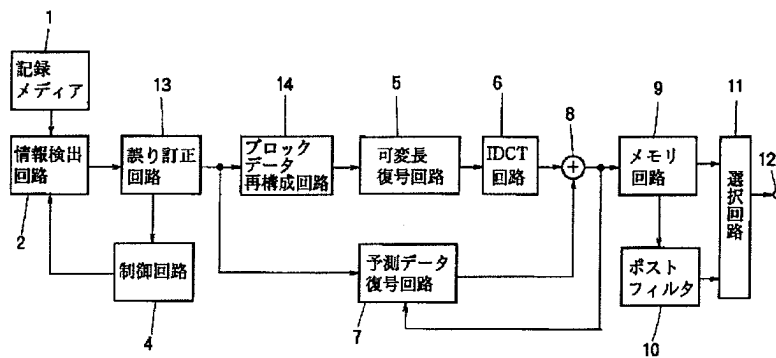
【図6】



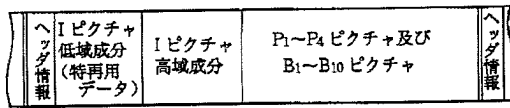
【図7】



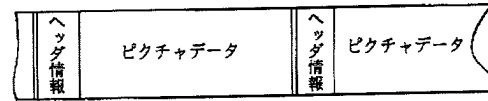
【図8】



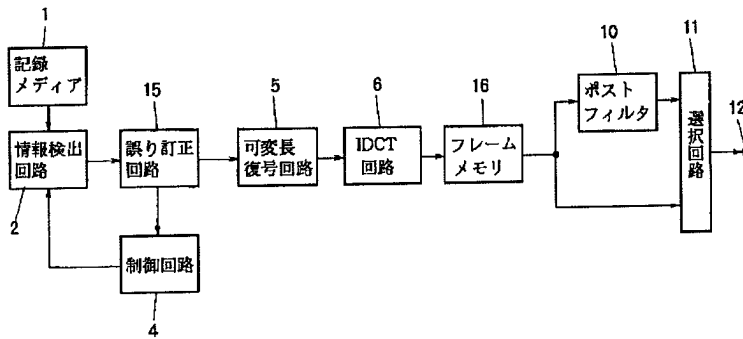
【図9】



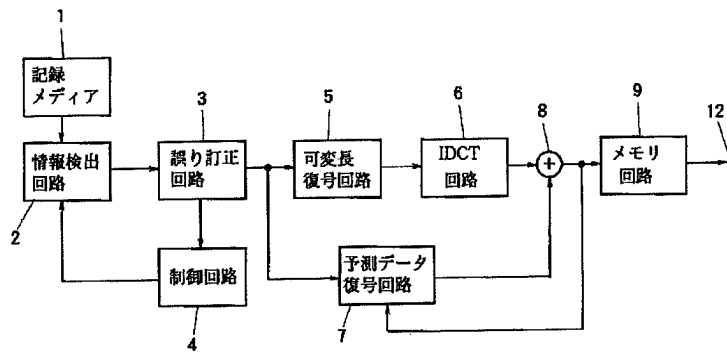
【図12】



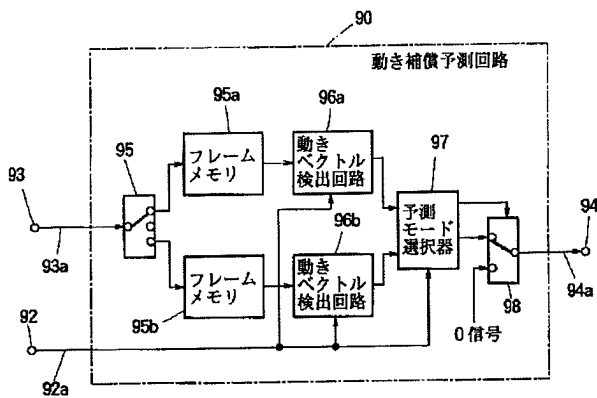
【図11】



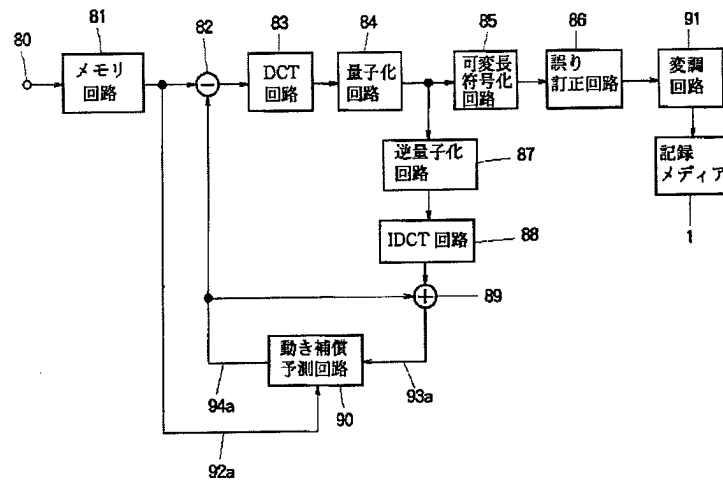
【図14】



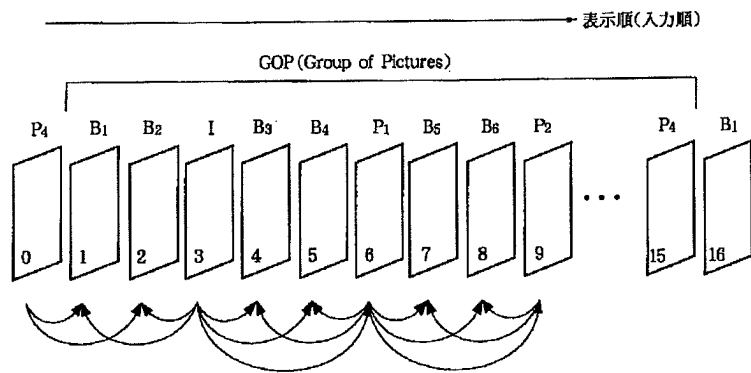
【図16】



【図15】

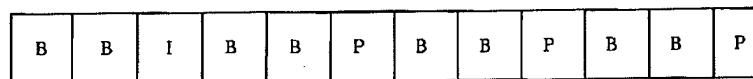


【図17】



【図18】

(a)入力順



(b)出力順

